

SUPPLEMENT.

The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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No. 2433.—Vol. LII

LONDON, SATURDAY, APRIL 8, 1882.

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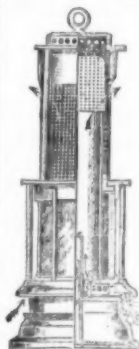
	Inches.	min. sec.
Normandy Rock Drill and Air Compressor, bored	1 1/16 x 10 1/2	2 10
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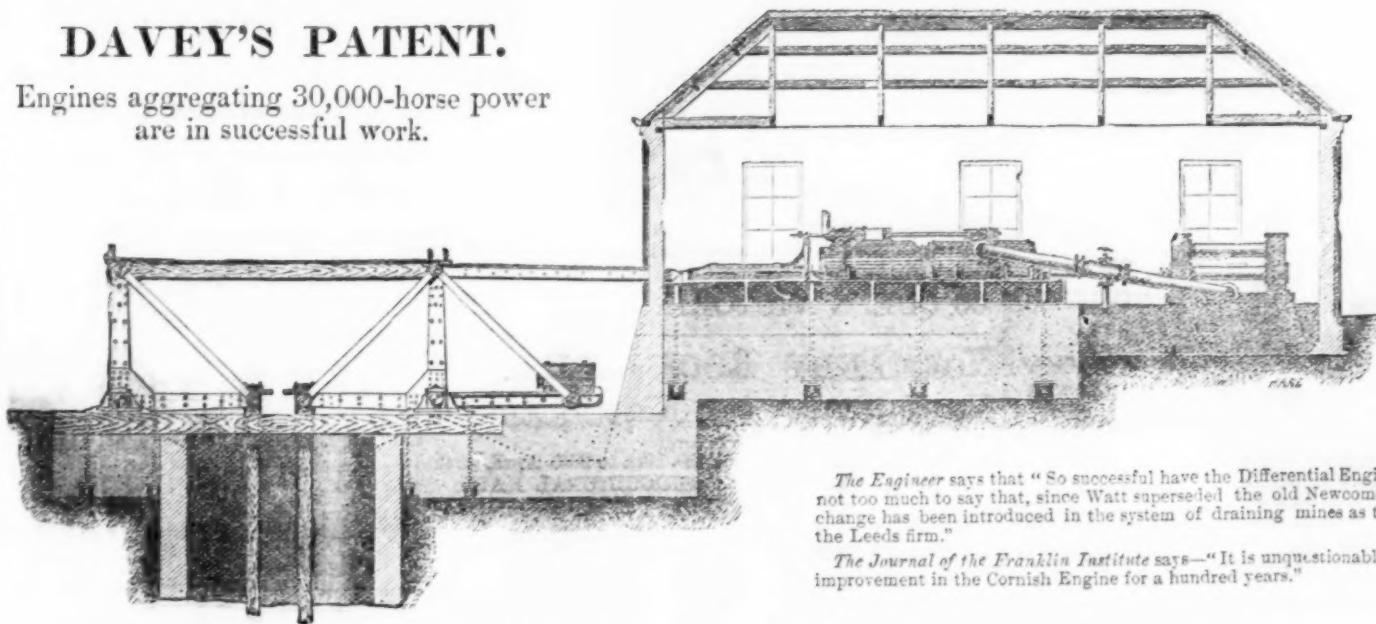
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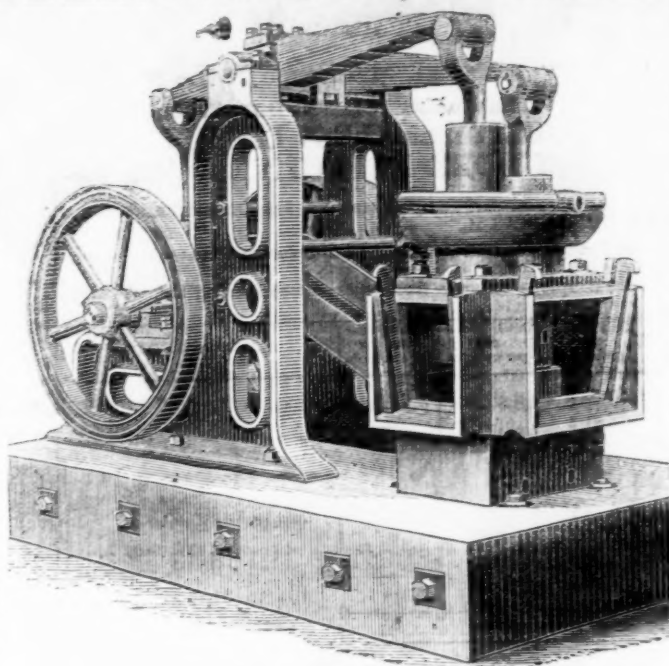
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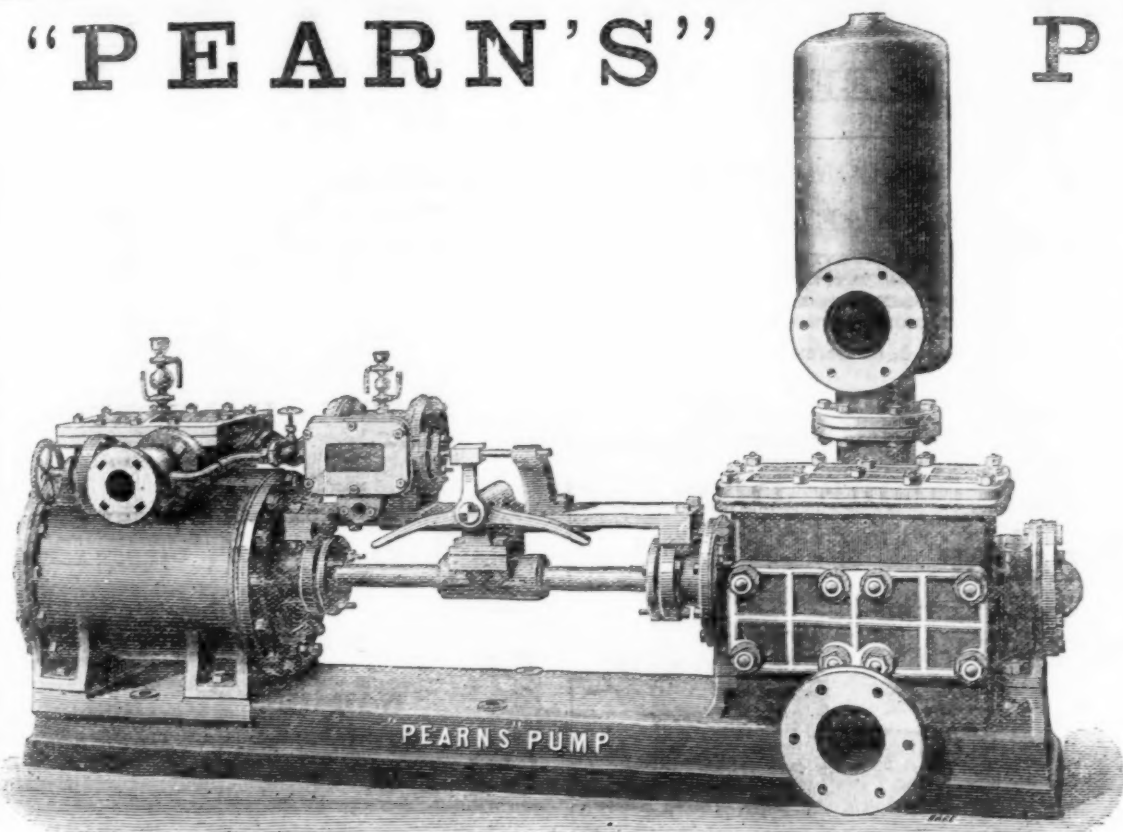
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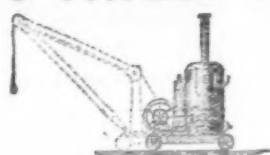
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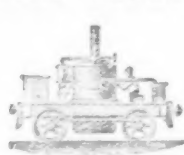
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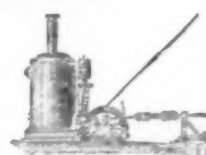
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MINING INSTITUTE OF CORNWALL.

CAMBORNE, 8TH DECEMBER, 1881.

SIR,—Having been requested by the Council to superintend the Rock Drilling Machine Contest, held at Dolcoath Mine to-day in connection with the above Institute, I beg to hand you the following report:—
The competing machines were the "Barrow," the "Cornish," and the "Eclipse"—each was fixed on the same mounting bar, and bored into the same stone. The result of the boring were as follows:—

Name of Machine.	Diameter of cylinder.	Diameter of Drill.	Time boring.	Depth bored.	Cubic inches of ground cut.	Cubic inches cut per minute.	Mean pressure per square inch.	Remarks.
Cornish	3½	2	1 15	4½	14.1	—	—	
"	—	1½	55	9	21.6	—	—	
Total	3½	—	2 10	13½	35.7	16.4	61	
Eclipse	3½	2	40	—	—	—	—	} Ran into Cornish hole; hole not properly watered.
second try	—	—	2 0	1	3.1	—	—	
third try	3½	2	2 35	11½	35.3	13.6	60	
Barrow	4	1½	15	½	1.2	—	—	} Gland to mounting bar broke.
"	—	—	2 0	8½	19.18	—	—	
Total	4	1½	2 15	8½	21.0	9.3	60	

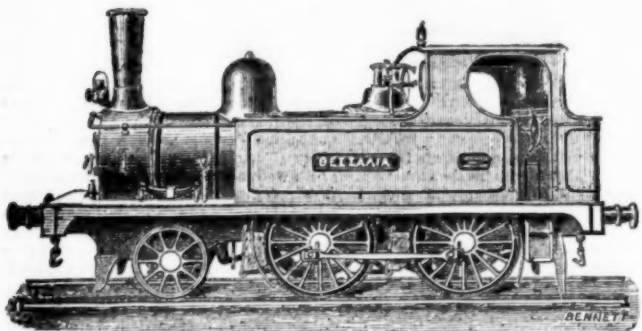
To R. H. Williams, Esq., C.E., President of the Mining Institute of Cornwall.

JAMES HOSKING, M.E.

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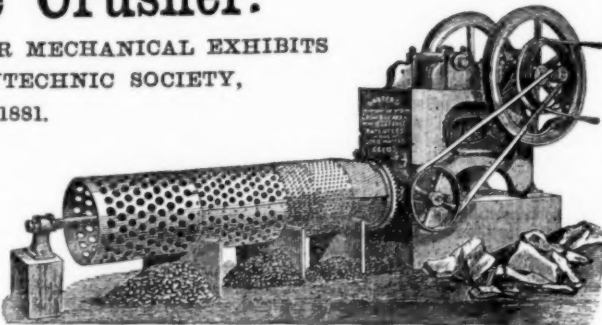
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London: MINING JOURNAL Office, 25 Fleet-street, E.C., and to be had of all
booksellers.

Original Correspondence.

THE GOLD AND DIAMOND FIELDS OF SOUTH AFRICA.

SIR,—In my last letter I gave an outline of a scheme for the proper working of the Kimberley Mine; but I omitted to mention that the adoption of that scheme would enable companies to avoid sinking or driving through the hard igneous rock. It would at the same time enable such fine companies as the Compagnie Française to haul out a thousand or more loads of blue (diamond soil) per day, although the whole of their claims might be buried with fallen reef. All who are interested in the concern will at once see that this is an advantage that cannot be overestimated. The reef liability might be allowed to extend over a greater period, and as all the companies would be working on diamond soil they would be in a better position to meet the reef liability. But, on the principle in which the Kimberley Mine is worked at present, there are companies representing over 1,500,000l., which are frequently debarred from working their claims; in fact, some have not seen their claims since they were first put into companies—and this is the reason why I have always advised speculators not to have anything to do with companies that are bounded by reef. The Central Company, as its name indicates, has 75 claims of 30 ft. by 30 ft., extending across the centre of the mine from north to south. Even this company has up to the present been able only to work 25 claims; but in about a fortnight from now they will have 50 claims to work on, provided no unforeseen accident occurs. The vagaries of the Mining Board are almost as great a liability against the Kimberley Mine as the reef. They force the Central Company to pay taxes to the amount of 108,000l. per annum, and only keep 25 claims clear of the reef and water. Few companies could stand such a strain. On Sunday last there was another serious fall of reef in the north-east of the Kimberley Mine. It buried the claims of the Standard Company, and I am of the opinion that this is merely the prelude to one of the greatest falls of reef ever seen in the Kimberley Mine, and from which all the companies east of the Central must suffer.

My attention has been again called to Mr. Kitto's letter to the Journal of Sept. 16, wherein he states that many of the companies were capable of paying from 12 to 20 per cent. per annum (at about half the price they were put into companies) if properly managed. The various half-yearly statements prove that he was perfectly correct; and when he said one or two may do a little more I presume he meant a very small and indefinite number, and had in his mind the French, Central, and British Companies. On Tuesday last the Central Company issued their quarterly statement, showing that during the quarter they had hauled out of the mine reef to the extent of 58,666 loads, at 3s. 9d. per load of 16 cubic feet. They washed 32,395 loads of diamond soil, from which they got 64,101½ carats of diamonds, which realised 106,720l. 18s. 9d. They have declared a dividend for the quarter of only 5 per cent., the reason for which I explained in a previous letter. I venture to predict that if they have fair play from the Mining Board their future dividends will range from 10 to 15 per cent. per quarter. I regret to say that of all the 14 large companies in the Kimberley Mine there are only four at the present moment worth the attention of speculators.

During the past week there have been rumours to the effect that some person was coming out from England to purchase the whole of the De Beers Mine. Whether they purchase the whole or not it has been proved that up to the present there is only a portion of the north and north-east parts of the formation that is payable. Out of the 14 or 15 companies in De Beers I only know three that are likely to pay dividends. If English capitalists contemplate buying the whole of De Beers Mine I would advise them to wait until the Victoria Company, which was floated at home at 300,000l., has declared a dividend. If the De Beers, Baxter's, and Schwab's Gully Companies cared to sell at present quotations it would be a property I could recommend to a strong English company, provided they retained the management in their own hands, and adopted the mode of working recommended by me for Kimberley. At Bultfontein there is a slight improvement, as one of the 15 companies is leaving a small profit; it is a private company, and is fairly managed. At Du Toits Pan there is not much alteration. The Anglo-African is doing fairly well; but the dividends of the Griqualand West, which is also a good company, are likely to be swallowed up in law-suits. Most of the companies in this mine will have to raise fresh capital very shortly. At Kamfer's Dam the nature of their finds is being kept a profound secret; but one thing is certain, they have not sufficient water for one-tenth of their requirements. At Otto's Kopje they are pushing on their prospective works in a legitimate manner. At Olifantsfontein they are getting a few diamonds occasionally, but it is thought it can never pay. The electric light has been started in Kimberley, and appears to be a decided success.

Many of the old diggers are returning from Europe to enquire what has become of their dividends since their ground has been put into companies. They complain bitterly of the manner in which the companies have been managed. We have had some nice showers of rain, and the temperature is more agreeable.

The enormous discovery of quicksilver reported to have been made at Somerset East, and which caused so much excitement a short time ago, turns out to be another "diabolical swindle." The planter has confessed to having put the quicksilver there; he has left the neighbourhood, and will in all probability favour some other locality with the benefit of his inventive genius.

Desperate efforts are still being made to impose upon the public by the circulation of false reports as to rich discoveries of gold in the Transvaal. The alleged discoverers are generally to be found lolling about the canteens, waiting for some person to stand them a liquor for being let into the secret. The Pothefstroom correspondent of the Diamond News says:—"Some more specimens of gold have been brought to town for inspection, and to try and raise spirit enough to start a company; but people who have the means are wise enough to keep out of the speculation." It is amusing to find how in their anxiety to get rich they contradict themselves. The Volkstein, speaking of the 300 ozs. of gold and specimens that Mr. H. Gwynne Owen recently purchased from the diggers, says:—"Mr. Owen has examined the country, and the gold was taken from a reef which extends for miles." In the following paragraph they say—"Mr. Owen has offered 250l. in cash for the discovery of a payable reef."

Now, as a positive fact, there is not the sign of a reef on the whole property outside the claims of Messrs. Davis, Howse, and Cope; and these, which are very small indeed, and only a few feet in length (in mining parlance pipe veins), were purchased from the diggers by Messrs. C. R. White and Hampson in May of last year, long before any attempt was made to despoil the diggers of their rights. This property cost Hampson and White 10,000l.; but they are now anxious to sell at a much lower figure, as the place is not turning out by any means so well as was expected.

There is a report current that many of the Boers are disgusted at the action of the Boer Government in granting so many concessions, and that the Volksraad are determined not to ratify them. On Saturday last I saw a letter from an old digger, dated Gold Fields, Feb. 14, from which I made the following extract:—"The diggers are determined to fight for their rights if necessary. The Lydenburg Boers have had a meeting, and strongly protest against the action of the Government. I do not know how it will wind up. I suppose the finishing stroke will be a civil war, and then it will be said who would have thought it?"

At the present time there are at least 50 owners of Transvaal farms in this place trying to sell their farms because there is so much gold in them (?), or at least they try to make people believe there is gold in them. The earliest concessionaires bought up all the gold from the diggers, so that those who came latest into the field have to be content with the circulation of their own statements, and the exhibition of little bits of white quartz, specular iron, or iron pyrites—the latter being at a very high premium. There are hundreds of persons in these diamond fields who could buy the gold diggings out and out; but they are not so green, and, consequently, they will be offered in England to supplement the Indian—well, failures.

It is generally considered that Mr. T. C. Kitto has a better knowledge of the mineral resources of the Transvaal than any other person, having examined it for the late Government and on his own

private account. I heard some gentlemen ask him last week what he thought of the Pilgrim's Rest, Lisbon, Waterfall, and other gold fields, to which he replied—"I think they contain gold in very dangerous quantities." "Why?" "Because there is just sufficient gold to induce the unwary to beggar themselves." Mr. Kitto has been asked to write a pamphlet on the mineral resources of the Transvaal, and I think it likely he will consent.

News from the Tatin gold fields is of a very satisfactory character as to the yield of gold; but the latest private advices state that the natives are in such a ferment that they (the diggers) expect to have to retire into the interior for safety. If any English speculators become infatuated with any gold samples they may see exhibited I should advise them to get the place inspected by an experienced man who is above being bribed, and whose head is not turned by the sight of a few ounces of gold. In October last the Waterfall Creek and several other farms belonging to Mr. H. G. Owen were all offered to Mr. James Hampson for 5000l. The offer was in writing, and as Mr. Hampson refused to give more than 800l. for the lot it fell through. In December last Mr. Owen offered to Mr. Palmer, the late gold commissioner, the half of all the mineral interest on his eight farms if he (Palmer) would undertake to prospect them for six months. Clause 10 of their proposed agreement stipulated that Mr. Palmer should send the necessary staff to Kimberley or England, if required; and clause 11 says—"Mr. H. G. Owen undertakes to use his best ability to form a syndicate, company, or to procure buyer or buyers on basis to be mutually agreed upon." Mr. Palmer, who is with me at this moment, says he could not entertain the matter, as the only bits of gold on the property are already in the hands of three or four diggers, and he would not be a party to try and deprive the diggers of their rights. I simply mention these particulars so that your readers may see exactly how the wind blows. Mr. Palmer thinks an attempt will be made to dispose of those farms in England. There appears to be more trouble in store for this distracted country. The Basuto question is far from settled, and the Zulus are displaying a feeling of unrest. Around some parts of the Transvaal the Boers and Kaffirs are fighting desperately, the former for plunder, and the latter for dear life. The tribes on the northern and eastern borders of the Transvaal are also preparing for war, and all the chiefs refuse to pay taxes to the Boer Government. I can vouch for the fact that the majority of Boers say they have been sold by a few intriguing Hollanders, and would hail the return of the English with delight.

Kimberley, March 2.

THE GOLD FIELDS OF INDIA.

SIR,—Capt. J. M. Rogers' letter in last week's Journal aimed—as I presume—at me as one of the managers formerly connected with the Colar gold fields, to say the most of it, may be compared to blasting a hole with damp powder. He certainly has attempted in a most high handed manner to refute statements made by me regarding the value of the Colar gold fields, but in reality he has shown by his statements, coupled with the actual results obtained at the mines, that the position I have taken up in the matter is not to be assailed with anything less than actual returns in the shape of golden bricks. Instead of refuting any statements I have made he has only strengthened my arguments by his own experiences in failing to find the bricks I have alluded to. Now, with regard to Capt. Rogers—Firstly, he has in no manner shown that the formation of rocks in the locality are not basaltic. In his former reports he has himself mentioned "trap rocks," and if I recollect rightly he has also referred to "basaltic rocks," as being in close proximity to the so-called lodes; therefore I would ask Capt. Rogers if he knows of any place in the world where gold has been found in paying quantities in basaltic formations, or in disturbed and volcanic eruptions of any kind? Secondly, mere statements such as Capt. Rogers has put forth do not prove the existence of lodes either productive or non-productive. In the sense in which the term "lode" is understood in the mining world it has not yet proved its existence in the Colar district, notwithstanding the many assertions that have been made to the contrary; although if taken in its abstract sense, according to the definition of the term by some eminent authorities, it may be said that hundreds, nay thousands, of lodes exist in the same district, as every outcrop of quartz may be called a lode, and it is only fair to assume that similar deposits may be met with below the surface, some of them existing within exceedingly small limits, while others may aggregate some hundreds or even thousands of tons of quartz. At the same time neither of these lodes—I will for the present call them—have anything in common with any other, from the fact of there being no slides or any other faults in the formation to heaven them any way. They simply exist, as I pointed out in a former letter, similarly to the felspar foliations or stratifications in a piece of typical gneiss. Under this head I would ask Capt. Rogers if he can remember the number of prospecting explorations he made as manager in the Mysore Company's claim where this statement has been verified? I have a faint recollection of having seen some there, but I do not know the total number. I would also ask Capt. Rogers if he has never had a "rap on the knuckles" for making such damaging statements? Thirdly, I have never stated "there was not an ounce of gold in the whole district." What I have stated is this, "Although gold may possibly be found in small quantities here and there, I have seen nothing to induce me to think it may be found in paying quantities, and that my opinion is that all money expended there in searching for gold will be totally lost." Although I had formed this opinion at a very early period of my acquaintance with the district, before I mentioned this to anyone living I had taken into careful consideration the geological peculiarities of the place, together with what I could see on other claims, and strengthened by the result of certain surface explorations, when I felt perfectly satisfied in my own mind I did my duty honestly by stating my convictions to my directors, but not before I was asked to state them, and even then these opinions would not have been made public as they have been only at the request of the board, and their action in publishing the report they did, so that the impeachment of having written uncalled for letters, as Capt. Rogers states, does not apply to me. I have acted in my own self-defence, as he would have done under similar circumstances I have no doubt.

Returning to the practical part of his letter, Capt. Rogers states—"I now most emphatically state that well-defined lodes do exist, and that such lodes are gold-bearing in sufficient quantities to give good profits to the shareholders. At the Mysore gold mines there are at present three distinct well-defined lodes opened out, and averaging 8 ft. wide." Consistency in the reports of any mine manager is the only guarantee to the public, or even to the parties he reports for, that such reports may be relied on as being truthful. In some of Capt. Rogers' first reports on the Mysore Mine he stated there were five distinct lodes on the property, in his letter last week he had reduced the number to three; this reduction in numbers has taken place in about a year and a half, therefore it is fair to presume that had he remained there another two years and three months, this number would have been reduced to *nil*. However, he has more than made up for the number of lodes by placing the average width of the three lodes opened out at 8 ft., but the discrepancy in the statements is very apparent when compared with the following clauses or paragraphs of his letter—viz., "In one lode they have driven over 18 fms. on its course. For that distance the lode is 5 ft. to 8 ft. wide, and every ton of that quartz will yield gold in paying quantities. From that level a shaft has been sunk some 80 ft. at an angle of 45° on the course of a lode from 4 ft. to 6 ft. wide. The numerous assays made showed a superior class of quartz as depth was attained. Also 10 fathoms from the shaft a winze is sunk 8 fathoms; a strong more well-defined lode cannot be seen anywhere." I am not sufficiently versed in the art of calculating to compute the average width of the lodes to be 8 ft. from the data Capt. Rogers has given.

Assuming, therefore, that the lodes do exist as stated by Captain Rogers, and taking the data he has given—not the average of 8 ft. in width—he should have raised something like 600 tons or thereabout of quartz from these different workings alone, which taken at his own estimate of what would pay, viz., 6 dwts. per ton—although he avers that this quartz contains gold enough to give good profits to the shareholders—he should, from crushing it, have been able to

pick up a good-sized gold brick to throw at me, not a gilt paper one, but a real substantial metallic one, which would have been heavy enough to have hurt me if it was hurled with the same violence as he has hurled the ink-droppings from his pen. Capt. Rogers commenced crushing with the Elephant stamps at the Mysore company's mine in September last, and had been crushing more than a month before I left the locality, and how long he continued crushing after I left I know not. Moreover, it was stated in the Madras Mail that 100 tons had been crushed before I left India; I ask it at all likely that he would have crushed such a quantity of worthless quartz if he had taken such quartz from the workings as he states? I know very well I should not have done it. Had the result been a produce of only 1 dwt. per ton it would have proved the existence of gold there, and there would have been some grounds for the shareholders to hope for a better return, as the workings were prosecuted in depth, but as the produce of gold has never been made public, it is only fair to assume that nothing was got from the quartz crushed in the shape of gold. I do not for one moment doubt Capt. Rogers' ability to get the gold out of the quartz if it was there, therefore the only conclusion that can be arrived at is that gold does not exist there in paying quantities. I know this much, had I been the manager of the Mysore Mines since last May, and have had lodes there containing gold, as have been officially reported to exist there, I should not have returned home at this time with half of my engagement only transpired without being able to exhibit a few gold bricks, if I did not throw them at those who dared assert that gold was not to be found there in paying quantities. At any rate, the statements put forth in Capt. Rogers' letter last week savours very much of "coercion" to me, knowing, as I do, of the facilities and means he has had of making returns of gold, if only in small quantities, provided the gold was there as he states it to be.

Cozenell-road, Birmingham, April 3.

CHARLES F. BRAY.

AKANKOO GOLD MINING COMPANY.

SIR,—I see in your report of the meeting of the Akankoo (Gold Coast) Mining Company, published in the Journal of Jan. 28, that Mr. Lane (appointed as engineer and manager to the company) said that the machinery which had been made by Messrs. Jordan was entirely useless, being too cumbersome to transport over the bar at Axim and into the interior of the Gold Coast country. Now, as I told Messrs. Jordan that anything up to 3 tons could easily be transported to the Akankoo Mine, I think I may be allowed to say something on the matter. Mr. Lane, knowing nothing whatever of the country, speaks with the happy audacity of utter ignorance. Not 3, but 7 or 8 tons can easily be transported to the landing place for the Akankoo Mine, and there the boats or lighters can lay alongside a fine steep bank, where shears or derricks can be rigged to lift any weight and place it on the bank within 600 yards of the best site for the works. If I had ever dreamed that Mr. Lane's objection to the machinery was on account of its weight I should have at once answered him. A great deal is said in the Chairman's speech about Mr. Lane's appointment. Mr. Lane was provisionally appointed pending settlement of title, to be confirmed when title was declared correct. During the time he was provisionally appointed he was requested by the board to inspect Messrs. Jordan's machinery (of course being paid for so doing), but refused to do any work for the company until his appointment was confirmed. After he was appointed he did go down to Wigan, and said he inspected the machinery in the space of 2½ hours. Inspect 30 or 40 tons of machinery in 2½ hours, and say that "Messrs. Jordan were a firm of no repute." I leave the inference to our unhappy shareholder. Although Mr. Lane could do nothing for the company during the time of his provisional appointment he found plenty of time to put himself into connection with advisers through whom most, if not all, of these troubles have been brought on the unfortunate company. No doubt it is very pleasant for Mr. Lane to be drawing 1200l. a year in England instead of on the coast, but it is not equally pleasant to the shareholders to have their capital reduced by that amount without anything being done, and, as far as I can see, without any present prospect of anything ever being done. As far as I can see we are throwing away 1000l. over Messrs. Jordan's contract, and nobody knows how much more, for the benefit of Mr. Lane's most valuable advice. I have already written to the Chairman about his speech, and requested him to correct it; if he does not I shall.

You will observe that I write this from Axim. My companion, Capt. Burton and myself have lately spent four days at the Akankoo Mine, and have carefully inspected the facilities for landing, transport, &c. Akankoo, the name of the mine in Fanti, means left itself, and it seems prophetic. A whole year has been lost, and now nothing can be done till the next season. How the shareholders can stand this I know not. Who can answer the question? In conclusion I protest most strongly against the wilful and wicked waste of 1000l. of the shareholders' money being thrown away in order to get clear of machinery, which, for aught anyone knows, may be, and most probably is, perfectly adapted to our purposes.

Axim, March 10.

V. LOVETT CAMERON, C.B., D.C.L.

MINING IN NEW SOUTH WALES.

SIR,—There is a marked advance here lately in mining enterprise especially since the Victorians came over, and suddenly showed us that our neglected mines were worth working; and, in fact, many of the most promising claims now at work are some of those abandoned in 1874. The following extract relating to the Copeland gold fields shows that Dr. Robertson (when out here) was pretty correct in his idea of the richness of the Prince Charlie and other reefs there:—

COPELAND.—Splendid rains fell during the last week. This will permit crushing at the several machines to be resumed. The Hidden Treasure Company started on Monday at Campbell's machine. They expect to keep the battery going for some considerable time, and will have about 350 tons to put through. So, the Hidden Treasure north have nearly completed the erection of pumping and winding machinery. This company deserves success, having spent several hundred pounds in erecting machinery. The prospects of the mine fully justify the outlay. No. 2 North Hidden Treasure have let a contract for sinking the main shaft a further depth of 50 ft.; good gold has been struck by the contractors. The Prince Charlie (Buckwell and party) are now raising some splendid stone from the 150 ft. level. The stone was on view at the office of B. Benjamin and Co., and pronounced the best ever raised from this mine. The Mechanics' Company are on really first-class stone, taken from a depth of over 350 feet. It is considered quite equal to last crushing, which yielded 4½ ozs. to the ton. The Centennial Line is working energetically, and all the claims look well. The Rainbow Company have broken through into the old shaft, and will soon start in obtaining another crushing. No. 1 East Mountain Maid, from the rich character of stone, is considered the best claim on the field. They have a large reef, and have already about 80 tons at surface. It is estimated to yield 5 ozs. to 8 ozs. per ton. No. 1 West Mountain Maid have started work with good prospects of success. The Albion Company, at Kerriput, are now crushing at the machine; the plates look well, and the machine worked by water-power, gives great satisfaction. Great hopes are entertained that the Stockyard and Grand Trunk Mines will prove to be two of the best properties on the field; good stone has been exhibited from both claims. The Caledonian Company have let a contract for driving a further distance of 30 feet. Prince Llewellyn have about 100 tons of stone, looking well, and intend starting crushing shortly. Hopes are entertained the year 1882 will see a great change in the properties of Copeland. A good sign now is that not one idle miner is on the field, and there are still enquiries for a few more good men.

The following extract refers to the new gold field near Carcoar, lately opened up by the Melbourneites from Victoria:—

MOUNT McDONALD.—Telegrams from this field announce that rich gold has been struck at Red Hill, half a mile west of the Balmoral claim. The reef is 2 ft. thick, and shows coarse gold. The Balmoral claim is also showing splendid gold, and the next crushing is expected to give over 4 ozs. to the ton. A new reef was discovered at Mount McDonald yesterday by Dr. Hodson, in his lease; shaft down 10 feet. The stone increases in richness, and there are indications of it continuing so. There are about 8 tons at grass, and it is estimated that the yield will be 4 ozs. to the ton. It has been christened the Hodson Reef. Some excitement has been caused in the neighbourhood by the discovery, and several leaseholders now intend to prospect between this new reef and their present workings, which is considered by experienced miners to be a network of gold-bearing reefs.

In the same district is the Great Blayney Copper Mine, another "revival" claim, but proving itself rich enough now to erect furnaces, and lease all the small coal it requires from one coal mine for the next 21 years or so. At the Wentworth freehold estate the Reform (lease) is raising rich pyrites as usual. This also is another "revival" claim, as after opening up ten or a dozen shallow mines on a portion only of the estate, and taking out about 6 tons free gold, it was abandoned for many years, till the chance shipment home of some of the neglected and despised pyrites and the wonderful yield from it led to this one small lease being again started.

The following extract refers to Gympie, in Queensland, and, i it

be true as stated in telegrams and letters from India that the reefs there will yield 1 oz. per ton, it should give the shareholders in the Indian mines some heart to see the return from the North Glamire (377 ozs. from 348 tons), as this claim is one of the steadiest dividend paying ones in Gypmie. Any reef over 2 ft. wide, yielding steadily about 1 oz. per ton, is a really good property, providing, of course, that it is properly worked and fuel and water are fairly plentiful:—

GYPMIE—Telegrams state that 200 tons of stone from No. 1 North Phoenix gave 577 ozs. This claim gave 1223 ozs. for six weeks' crushing, and has declared a dividend of 2s. Two fresh leaders, carrying excellent gold, have been struck in a short fortnight's crushing. The North Glamire obtained 277 ozs. for three weeks' crushing, and 80 ozs. from a new patch. The Phoenix Prospectors claim yielded 523 ozs. for a month's crushing; No. 1 North Phoenix, 253. Monday's telegram reports that No. 1 North Glamire have declared a dividend of 2s.; No. 1 North Phoenix have declared 2s. per scrip. They have also struck two new leaders in sinking. They are small, but show nice gold: 343 tons from the North Glamire yielded 277 ozs. On Feb. 3 the Wellington tribute had cleaned up for 314 ozs. of gold, and St. Patrick No. 1 south for 947 ozs.

There have also been late discoveries of large galena lodes, rich in lead and silver, and also a proportion of gold, within a reasonable distance of Townsville, in Queensland, and the capital to work them is now being raised partly in Sydney and partly in Paris and Hamburg, as the continental capitalists are evidently more alive to the mineral wealth of these colonies than the English ones. R. D. A. Sydney, New South Wales, February.

RICHMOND CONSOLIDATED MINING COMPANY.

SIR,—The letter of your correspondent, "S. H.," in last week's Journal, and the paragraphs from the Eureka Leader which accompany it, have doubtless been read with interest by every one of your readers who has a stake in the Richmond Mine. The disclosures they reveal are already, we may presume, engaging the serious attention of the directors of that mine; but that a systematic course of robbery, such as is described in the Nevada Journal, should have been successfully prosecuted for such a length of time, without any suspicion of foul play having been excited in the minds of the executive, would seem to indicate a laxity of supervision on the part of the manager which at least requires explanation. The shareholders have perfect confidence, I believe, in Mr. Probert, nor would they wish in any way to curtail his occasional absences from his duties, which are necessary indeed for the maintenance of his health. At the same time it should be remembered that we no longer possess the invaluable services of Mr. Rickard, and that at the present moment there is no one on the spot who is qualified to undertake Mr. Probert's responsible duties during his temporary absence from the mine. It is, therefore, greatly to be desired that there should be no unnecessary delay in appointing a duly qualified officer in Mr. Rickard's room. I do not think the revelations now made public need cause any alarm to the shareholders, or that they are likely injuriously to affect the prospects of the mine. In one respect—and that an important one—they will rather benefit it, by showing that the falling off in the returns during the last few months has not been due, as some suppose, to a general deterioration in the Richmond ore, but mainly, if not entirely, to an organised system of robbery, by which the low grade ore of an adjoining mine has been interchanged, and to a very large extent, for a corresponding quantity of our best and richest ore. As the discovery of this conspiracy was only made on the 9th of last month, it is not likely that the Richmond board would be able to furnish much additional information to what is given by the Eureka Leader, so that the shareholders may have to wait a month or more for any official account of the affair. In the meantime, however, it would not be time misspent if the shareholders were to press upon the board, as a subject deserving of their careful consideration, the suggestion made at the close of your correspondent's letter that the Richmond Company should become the purchasers of the Albion Mine. The proposal is a bold one, and it is doubtful whether it would commend itself, at least on the terms stated, to the Richmond Executive, but no one can doubt that if the differences between the two mines could be adjusted on reasonable terms out of Court it would be a gain to both parties, but more especially so to the Richmond in its present circumstances.

April 4.

C. W. K.

RICHMOND CONSOLIDATED MINING COMPANY.

SIR,—The Mining Journal of last week contained the only account I have seen published in England of the extensive frauds perpetrated by the tributers employed in the Richmond Mine, who have filched ore from the disputed Albion ground, and exchanged high grade ore for low, between the Richmond Mine and the Eureka Consolidated. A friend of mine in Eureka has sent me the Ruby Hill Mining News, which contains a full and clear account of the *modus operandi*, and of the motives which have influenced the tributers in carrying out their nefarious practices. As this account may interest your readers, I have enclosed the paragraphs for publication in this week's Mining Journal.

The article in question is prominently headed—"The Big Steal"—A pretty plan for pilfering—Crooked pranks underground—and How the Tricky Tributers Robbed Peter to pay Paul, and worked Albion, Richmond, and Eureka Consolidated, and goes on to say—the subject of the big steal in the Richmond and Albion Mines has been much talked of and commented on since its discovery, and the thorough unravelling of the case brings to light some interesting features. In order to thoroughly appreciate the situation, our reporter visited the scene of depredation on Saturday evening, and had an excellent opportunity to observe the results, and the *modus operandi* employed to compass the steal. Our first landing at the sixth level, and from thence we were shown along the No. 1 fissure drift, which runs westerly, and direct for the Albion ground. This, be it understood, is an old and abandoned drift, and extends in the neighbourhood of 1000 ft. to the point where the Albion is tapped. At the further end 60 ft. of the car track had originally been torn up, and close to the end a heavy bulkhead had been built, cutting off all communication with the Uncle Sam drift, in which the Albion ore was stored, and which communicated with the drift in question by means of a small shaft or upraise. The Uncle Sam drift was for a distance of at least 100 ft. piled full of the sacked Albion ore now held by litigation, and the ore filchers conceived the brilliant and highly successful plan of stealing this ore from the Richmond side by means of tapping the pile from the rear and through the abandoned shaft, and delivering it through the old fissure drift referred to.

To accomplish this required some fine engineering, and not only that but a shrewd system of concealment was necessary to escape detection in the scheme. The old drift was cleared of 60 ft. of torn-up track replaced by material from another drift, and everything put in shape for running a car. The bulkhead at the end of the drift, which was made of heavy timbers, was removed, and a fine counterfeited it made. This admitted of a door being cut through, which, when not in use, was neatly closed and clayed up, so that no tell-tale draft of air would discover the opening, and to all appearances it was perfectly intact. Several feet of a false track approached the door, which being taken up would lead to the delusion that it did not have any connection beyond. The upraise beyond the bulkhead and at the end of the drift was blasted out, and a fine chute put in, which not only gave opportunity to remove the ore from, but served as an entrance to the store-house drift of the Albion. The mouth of this ore drift was so piled up and bulk-headed with sacks as to not discover the operations of the filchers behind, and everything, in fact, was most artfully concealed.

The sacked ore was emptied into the chute, and from there taken in cars over 1000 ft. along the fissure drift to the sixth station, and thence along the main sixth level to the private shaft on the line between the Eureka Consolidated and Richmond. Here a very artful contrivance was arranged, which served a double purpose—to deliver not only the stolen Albion ore, but tribute ore from the Richmond into Eureka Consolidated ground. In order to accomplish this end an upraise from the Eureka Consolidated of over 40 ft. was made. It was this could have been run through solid lime and made to connect so accurately and perfectly with the Richmond above is a mystery, unless improved instruments were used to lay out the work. But it was done, and a very cunningly concealed shaft opened at the side of the track in the Richmond drift. Down this private shaft the carman dumped the stolen Albion ore. Immediately above this shaft was a regular tribute chute which led from the "Little Pot's" Chamber above. The two could be thrown together, so that tribute ore could find its way into the Eureka Consolidated by the same route. When not in use the private hole was carefully plankled over, and so concealed as to baffle detection.

In order to work unmolested, it is said that the cunning operators frequently chose Sundays as an opportune time, when the mine was closed down, and made their way into the ground by descending the old Macrellina shaft near the R. K. and working their way into the ground by means of the old ladders and galleries by a roundabout way through the E. K. Eureka Consolidated, and Richmond. One place was shown as where a very hazardous climb had to be made through a deserted winze, by means of a rope, in order to make the trip. The place was a dangerous one and few but expert miners and old hands would attempt the passage by such a route. Aside from Sundays ample time was afforded the thieves by the aid of implicated watchmen, who made it convenient not to discover them, and the system of robbery went on smoothly and systematically. It is estimated that the Albion steel and the necessary arrangements to perfect it must have taken at least two or three months to accomplish. In the Uncle Sam drift, from which the ore was taken, a large space is cleared out, and 250 or 300 sacks piled up near the blind chute testify to the amount of ore pilfered. It is estimated at about 35 tons.

The fatal mistake made by the enterprising pilferers was that they unfor-

tunately struck the wrong end of the drift and secured nothing but low grade ore, which, if smelted at the Eureka Consolidated, would not have netted them more than 40 or 45 per cent. at the most. Perhaps, if undisturbed they would have reached the high grade ore in time.

The first suspicion of the steal was on the Albion side, but it was so skilfully handled that the Richmond managers thought the possibility of its existence nearly absurd; but on this one, no doubt, a quiet investigation was begun, which resulted in the exposure. The steal from the Albion is a bagatelle compared to the robberies that have been made from the Richmond and Eureka Consolidated Companies.

The point in these steals is covered by the fact that Eureka Consolidated pays a larger percentage on high grade tribute ore than the Richmond, and low grade ore brings more, or as much, at the Richmond. This state of facts brought about a regular systematised exchange of ore between tributers near the line. Not only has this exchange been carried on, but there have been numerous other greater filches. We were shown one case in which a company chute has been tapped from below, and the removal of a plank would allow company ore to escape into a tribute chute.

The ore exchangers, it is roughly estimated by some, have gotten away with at least \$40,000 or \$50,000 worth of ore, but it would be, in our estimation, difficult to form even an approximate idea of the amount. The principal exchange was no doubt made through the private chute referred to into Eureka Consolidated, while another chute on the seventh level furnished an outlet for ore from Eureka Consolidated into Richmond. Thus much is a description of the practical method of the steal, but, perhaps, the work of conspiracy was more ingenious and harder to arrange. We have it on good authority that there were no less than 20 or 25 persons in the ring.

It is a self-evident fact that no such extensive operations could have been carried on without the cognisance of more than one trusted employee of each company, and watchmen, carmen, and even higher officials were per consequens implicated in the affair, and, no doubt, several who were not active participants were silent accessories. It is not within our knowledge or province to disclose the names of several parties suspected of complicity, aside from the one or two of the apparent arch conspirators; but the matter will be thoroughly ferreted, and an exposition of the guilty parties throughout will come to light with investigation. The *onus* of the affair rests most heavily upon foreman Wm. Harris, whose inability to satisfactorily explain away these mysterious proceedings, if not implicating him, charges fairly a criminal neglect. To him was entrusted the supervision of the underground workings, and if he either knowingly or unknowingly permitted such flagrant practices he is guilty of a serious breach of trust. His subsequent resignation and departure point with strong suspicion to his guilt.

That the managers of either of the mines were implicated is not for a moment entertained, and it was through their efforts that the matter has been brought to light. The whole affair was carried on through the duplicity of trusted servants and under-employees of the companies, or it could never have assumed such proportions. The plan throughout was an admirably conceived one, and the engineering of it showed some genius in the leader, whoever he may have been. Notwithstanding the perfect arrangements of the steal, the managers nipped the thing fairly in the bud, and put an early stop to the scheme.

A bench warrant has been issued for the arrest of Sam Reynolds on a charge of drawing a deadly weapon on Manager Probert, of the Richmond, during the late tribute fracas, but from the accounts the festive Samuel is far beyond the reach of Judge Rice's warrants, and will shortly be reveling in a land where naught but the inconvenient reach of the extradition laws could disturb him.

Samuel, *en route*!

The position of shift boss made vacant at the Richmond by the promotion of Sam Longley has been accepted by John Masterson, one of our old-time miners and prospectors. John is a good square man, and a practical miner of long experience, and we are pleased to note his appointment.

York, April 3.

S. H.

THE SUPPLY OF GOLD.

SIR,—I have read with much pleasure the interesting and valuable contribution to this question by your correspondent, Mr. Del Mar, in last week's Mining Journal. When I wrote the letter which you were kind enough to insert in the same issue I certainly could not have anticipated that my remarks on this subject would be so strongly corroborated by a gentleman personally unknown to me, but one who is evidently well qualified, from extensive practical experience and knowledge, to speak with authority upon it; and I think it may be accepted as a generally acknowledged and indisputable fact that the supply of gold is, indeed, rapidly declining, while consumption and demand for it is getting greatly on the increase, which, apart altogether from the further greatly enlarged demand that will certainly take place so soon as a complete revival of commercial prosperity is experienced—is bringing about what Mr. Del Mar describes as a "critical condition of affairs, full of danger to the most important interests of society."

Mr. Del Mar has favoured your readers with a rapid yet comprehensive and masterly survey of the past and present sources of the supply of gold, and certainly the impression he conveys is not very encouraging for those who may be trusting to any considerable increase in the supply from the gold quartz mines which have yielded so largely during the 35 years that have elapsed since the discovery of gold in California. Geographical discovery and the search for gold have been prosecuted so energetically during that time in every quarter of the world that no very sanguine hopes can, perhaps, be now entertained of extensive alluvial deposits of that metal being discovered, except it may be from the still unexplored portions of Central Africa and other equally remote and as yet inaccessible regions. On gold quartz mining with improved appliances, and the extension of hydraulic mining in the gold fields now known, the chief reliance must, probably, be placed for that increased supply of gold which is now so urgently required.

Much interested in the question as a geologist, although I have never held a share in any gold mining company whatever, or having any connection with gold mining, I anticipate with much interest the further communication Mr. Del Mar has promised as to the quarters where the commercial world must look to obtain its future supplies of gold. In the meantime I may mention that being struck with the various notices of late in the Mining Journal and elsewhere of the large amount of gold obtained from El Callao Mine, in the province of Guayana, Venezuela, I have been reading the works of various travellers in that comparatively unknown, although very accessible country, and the impression produced on my mind has been that from that province there is every probability of supplies of gold being ere long got from it that shall rival those of California and Australia.

There is an abridgment of a most interesting paper by Dr. C. Le Neve Foster, on "The Caratal Gold Fields," and also notes on "The Geology of Guayana" by Prof. Ralph Tate, in which a description of the same district is given, both published in the "Proceedings of the Geological Society," June, 1869, to which I may refer those of your readers who are interested in the subject. From those well-known and reliable authorities I find that the auriferous area then known in the Caratal gold field is "about 12 square miles, the whole of which is traversed by gold-bearing quartz veins, averaging in thickness 2 to 3 ft., most of which have yielded visible gold in abundance." "The richness of some of the lodes," Tate says, "and of the placer digging of this auriferous tract, fully justifies the appellation of El Dorado, which has been given to it, and it may be the El Dorado that incited Raleigh to penetrate Venezuela, but which he failed to discover." Foster states that when he was there "the gold workings were comprised within a circle of 3½ miles, with Nueva Providencia as its centre," but besides that two American gentlemen had found gold on the River Paragua, and just before leaving he heard of the discovery of a lode of gold quartz in the hills to the south of Pastora. Gold had also been found at Upata, and Dr. Rassard, to whom the knowledge of the Caratal gold field is due, had informed him that a lode of auriferous quartz had been found on the banks of the Cuyuné river in British Guayana, all facts going to prove that the auriferous rocks in the district in question are spread over a very considerable area indeed.

I could quote other authorities, but, fearing to trespass too much on your space, interesting as the subject is, I shall here only further refer to the "Land of Bolivar," by James Mudie Spence, F.R.G.S., and member of the Alpine Club, whose beautifully illustrated volumes of travel and adventure in the Republic of Venezuela, published by Sampson Low and Co. in 1878, refers to the "rich and productive gold mines of Guayana, which prove that the dream of the early Spanish conquerors of El Dorado, the Land of Gold, were not an altogether baseless fabric." Spence quotes a paper on the minerals he collected during his travels in Venezuela, by Professor W. C. Williamson, F.R.S., and President of the Microscopical Section of the Literary and Philosophical Society of Manchester, which was read by him before that society on Jan. 27, 1873, in which Professor Williamson states that "Gold quartz of the richest kind came from the province of Guayana, where vast regions of auriferous rocks occur, and where gold is found in grains, flakes, and nuggets of all sizes, from an ounce to many pounds weight, in a clay from 2 to 8 in. thick, as well as in a red peroxidised iron earth, both probably alluvial drifts; and that the quartz veins of the district are also richly impregnated with gold in crystals and strings."

The production of gold from the Callao (68,000 ozs. last year and

8115 ozs. in the month of January last) and Chile quartz reefs are only what might have been anticipated from the foregoing descriptions of the auriferous region of Guayana; and now that this country—rich in every sort of mineral and vegetable products, and in which, Spence states, that "the produce of a month's labour is amply sufficient to feed, clothe, and house the labourer and his family for a year," and in the mountainous districts of which the climate is remarkably healthy—is being opened up by the railways now in progress. I think I am warranted in directing the attention of your readers and all interested in this industry to the province of Guayana, in Venezuela, as probably one of, if not the most, important quarters from which future large supplies of gold can be obtained.—London, April 5.

F. G. S.

THE KEY NOTE TO WEALTH—

ASSOCIATED FOREIGN MINING AND SMELTING.

Combined with the promotion of successful Public Mining Companies, which is the only direct short route, with limited means to acquire speedy colossal fortunes.

Revelations, and full explanations upon the above subject,

BY THOS. J. BARNARD.

SIR,—And, once again, after a lapse of years, during which time the writer has travelled and sojourned in many parts of the world, and passed through a few changes and scenes, your old regular correspondent, who at one time never failed with his weekly budget to espouse the cause of mining at home, and who during his perambulations, has been but a looker on and stranger to your esteemed columns, which echo their sentiments into the most remote regions of the globe, and wherever the least vestige of mining exists sends you and your numerous readers greeting away across the ocean, from the Alleghany Mountains of North Carolina.

Yes! These lines are penned by one who, before trying his fortune abroad, devoted years to the cause of mining in England, not merely in one degree, but in all its many phases, sometimes as a private proprietor and worker of mines, at other periods as a promoter of companies; again, as an inventor and patentee for the concentration of poor ores—indeed, few in England ever worked more hard to achieve a legitimate success, or collected together and spent larger sums of money, for the weal of English mining than the writer, whose name was once as familiar as household words with capitalists, merchants, agents, workpeople, and one and all interested in the welfare of home mining. This is not mentioned as an egotistical parade, and the sincerity of the assertion will soon dawn upon your readers as they further peruse the subject, but it is necessary to narrate these facts *en passant* in order to arrive at the desired point in the proposed explanations of "The Key Note to Wealth."

Forsooth! Who does not recollect the spacious offices in Palmerston Buildings, with its staff of clerks, conducted by your humble servant, and representing several prominent and well-known mines, which directly their guiding hand and the aid of capital was withdrawn from them passed into obscurity!

Again, who does not recollect the rocks of copper and specimens of silver ore on exhibition, the occasional products of these mines, always enticing, or, as they say in Cornwall, "Keenly and slogging!" And still again, who does not recollect, the cynosure of all eyes, the tandem team that was driven by its owner to and from business, the whole surroundings attached thereto being indicative of wealth, unfortunately derived only from promotion emoluments, and not by the stability and lasting wealth of rich mines. Alas! no! for let us look into the sequel and ask, What was the final result? Echo answers, result! nothing but signal ruin, inglorious defeat. And why? simply because the mines were not a commercial success, simply because instead of affording support, from the very alpha to the omega they had to be supported, and, *O tempora! O mores!* the same must unfortunately be said of the generality of home mines. Now let it be fairly understood this is no attempt to cry down England or English mines. "Speak well of the bridge that carries you across safely." Bless dear old England—given riches, it is the first and best country of the wide, wide world; and bless dear old Devon and Cornwall, with their always some vivid pleasant remembrances; but facts are facts, and many of your readers, as capitalists, have no doubt drained the bitter cup to its very dregs by unsuccessful home mining investments, whilst others, as promoters, know what a thankless task it is to pioneer several mines requiring large amounts every month to meet the pay-sheets—in fact, it is impossible to conceive a worse task than having to pilot a plurality of mines at one time, not exactly absolute failures, but utterly devoid of any commercial success, by reason of their only contributing, from the production of mineral, about 250*l.* to every 1000*l.* of their working expenses; but let it also be admitted that the conduct of an office in the City of London, where dividends and not calls are the order of the day, where elegies and thanks take the place, to use mild terms, of lamentations and hard words, such, indeed, is a perfect elixir of blissful content and repose, the very acme and elysium of gratified ambition; and there is at least one who can speak feelingly, by dint of having passed through the respective seasons in their best and worst forms. Yes! it is not the dearth of money, knowledge, brains, pluck, or perseverance that causes the short list of dividend-paying mines in England, for there is certainly no lack of these essentials. But let us review the scenes of last year; it is the old old tale which repeats itself over and over again. After a rather long lull, an extended period of depression, when so many thought that English mining was ended for ever, came a perfect *furor*, and company after company was launched, with what result is now well known, and comments are needless, nevertheless, periodically the same rage will go on in the old country for at least generations to come, albeit the dividend mines may be counted on the fingers of one hand. About 18 months ago a message came from across the sea, several prominent men by deputation having requested the writer to return and take the lead in forming several companies to rework some old mines, but it was declined, for what is the use of labouring hard to lose money? Well, granted! admitted it is quite true that promoters as a rule come out uncathected and with profits, even when the enterprise is a failure, still, on the other hand, how much larger and more lasting are the benefits derived from a real success, added to the smiles and blessings which always accompany prosperity and fortune?

What will some of your readers say to this? I maintain that at the present moment it would be easy enough for me to return to England, secure the lease of a Cornish mine (there are scores to select from), and in a few weeks raise thousands of pounds to work the property—yes, far more easy than by the aid of the capital raised to find sufficient mineral to pay costs, for the last named is almost an impossibility, the odds against being too great, whilst the art of promoting a company, and collecting together thousands of pounds, is confined to the starting capital of a few 5*l.* notes, combined with the knowledge required, and added to tact, pluck, and perseverance when the reward of success is sure to follow; that is, so far as the raising of the money is concerned, but genuine real promoters, as a rule are born intuitively as it were to the business, and possess great ambition, hence they never attempt to float any mining company without having unbounded faith, whether misplaced or not, in its success, which accounts for their sometimes being worth 50,000*l.*, and at other epochs realising the want of a 50*l.* note, for such a speculator of genuine, and knows no bounds, if there is any remote prospect of good luck, and will cheerfully sacrifice everything—his horses, carriages, pet tandem, articles of vertu, and all belongings, and sell the very bed from under him, with an outward unflinching composure, to be all swallowed up underground, since hope need never be entirely shut out, as it is always open for one lucky stroke of the pick, to be the means of redeeming lost wealth with compound interest; and that fortunes are sometimes made even in Cornish mines, where so many failures are proverbial, is proved beyond doubt by the statistics of the past, more especially in the good old days of yore.

Nothing could have induced me to leave dear Old England but the inability to command success upon its shores, and words cannot describe to those who were not taking a part in this particular drama of life, the never-ceasing persevering efforts that were made to deserve it, but all was useless, of no avail, and with the combined aid of the first amongst the most practical Cornish mining captains of the day

who were the quintessence of zeal and ability, and had but to ask to have the necessary means for carrying into effect any desired project: still with these and other kindred advantages the lottery of English mining, so far as the writer was concerned, ended in drawing many blanks, and no prize. However, perhaps all is for the best; it may have been as the Turks call it, "kismet," or fate, and certainly the opportunity has in consequence been presented to test for oneself the statements of mineral wealth heralded from the New World, as also from Peru, Mexico, &c.

Methinks your readers will exclaim, Well, what of these countries? and the response is, the old adage stands good for all time and places, "All is not gold that glitters." Frequently, after travelling hundreds, and in some cases thousands, of miles in company with Cornish mining captains, most experienced men, to inspect the reported treasures, ocular demonstrations have been too convincing that many of the vaunted El Dorados are but mere myths; but it must also, on the other hand, be confessed that by extended perambulations, and diligently seeking, untold wealth may be and is revealed, more especially in the isolated mountains, unknown to fame, where civilisation is at its minimum, and the mineral developments are in a mere embryo form, or have been conducted on the most primitive principles—in a word, where the exceptionally bad roads for transit, and the distance from any market for the ores, is too great in such cases to admit of the required commercial success centered in that vitally important business talisman, *yelept profit*.

Of course, there are on this side of the Atlantic rich mines on the market, where the surroundings are *comme il faut*, proved mines of considerable revealed wealth, and with great promises for the future, but for such fabulous prices are asked, \$250,000 or 50,000, being considered a mere bagatelle. But fortunes are never or rarely realised by exchanging fortunes to secure them—nay, indeed, they must either come by lucky inheritance, acquired by birth or gift, or through the means of a spirited *coup de main*. The buying cheap and when possible selling dear policy in any business will accomplish this object, given time and scope enough, but to successful mining alone is reserved the palm which "takes the cake," for the sudden accession of comparative poverty to superlative wealth, since a few pounds outlay, by the sudden discovery sometimes of great mineral wealth in a new district, lead at once to immense riches.

It is no uncommon occurrence whilst travelling through the mining regions of the United States to occasionally come across and often hear of men worth their hundreds of thousands of dollars who commenced with nothing but their heads and hands; still, of course, these cases are somewhat exceptional. But time runs on, and we will without further preamble come to the object in view, and endeavour to explain how by the aid of diplomacy, which can be brought to bear upon the matter, and with a little outlay, a few of your readers may join me in a project by which we cannot lose, are sure to win largely in any case, and if only one or two of the properties themselves turn out prizes—an almost absolute certainty—we shall amass colossal fortunes. The foregoing reservation is made not with any implied doubt, as will be seen by the sequel to follow, but mining is always a speculation more or less, whereas the promotion of companies rarely fails in any case to reap large emoluments, and with the real success of the companies promoted princely results are sure to follow.

Just a word or two respecting these mines from whence I now hail, although they are not for sale, but merely as instances of what may be accomplished in other mining regions, of which there are hundreds far richer, and some with greater beneficial surroundings. It is now over 50 years ago since the first discovery of mineral was made here, but owing to the world-wide usual drawback—viz., a preponderance of low class ore against a limited quantity of rich material added to the nearest market, Baltimore, being upwards of 400 miles distant, the first 45 miles to the railway station passing over to this day the most diabolical road imaginable, no efforts were made to vigorously work them, as a commercial success was consequently hitherto out of the question, until Capt. Joseph Tregellas, George Page, and I appeared upon the scene some 15 months ago. The properties are now owned chiefly by a few Baltimore capitalists, and bid fair to be some of the first dividend-paying copper mines in the States. The secret of success is very simple—viz., concentration by smelting—first there is a small quantity of rich ore that will assay 40 to 50 per cent., but the whole vein or lode, which is 10 feet wide, averages only 5 per cent., still it is at this point of low-class quality where lies the mainpring of the whole enterprise, since the quantity exists, which is easily dressed to 10 to 12 per cent., and then passed into the smelting works situated within a few yards of the dressing floors. The transit of coal to the mine for the blast and other furnaces would be worse than conveying the low-class ores to market, and a commercial failure must inevitably follow such a course if pursued; but instead of coal nature has been lavish with a profuse abundance of timber, which is converted into charcoal by contract, and delivered in the charcoal house close to the furnaces for a ridiculously low rate, 4 cents, or 2d. per bushel, but the coloured element, or negroes, who make this part of the business a speciality, earn good wages at such prices, 3s. to 4s. per day, considering that edibles here in the mountains are very cheap—beef and mutton 2d. to 3d. per lb., eggs 4d. to 5d. per dozen, fowls 5d. to 6d. each, and other requisitions of consumption at equally low rates. We have Capt. Joseph Tregellas to act as head agent and superintend the working of the mines, with several other Cornish captains and miners to take the lead underground in carrying out the same, whilst the coloured race, who work well when under guidance, form the main source from whence the supply of manual labour is derived. The smelting works are conducted by Mr. Thomas James, a Welsh smelter, who was for 15 years with one of the first smelting firms in America, Messrs. Pope, Cole and Co., Baltimore, and who has also had considerable experience in Mexico, &c., his younger days being passed, and ground-work of knowledge gained, across the Atlantic, in the neighbourhood of his birth, at the renowned smelting works of Llanelly. These apparently digressive descriptions may appear somewhat irrelevant to the explanation of the subject, but they are mentioned with a set purpose, as I wish to convince your readers that apart from the old proverb "necessity is the mother of invention," and having myself had unusual opportunities to practically master all the details and become acquainted with foreign mining and also smelting, I have it within my province to command all the elements of knowledge from experienced men, who will proceed at my wish to pioneer and assist in developing any of the unexplored districts, where fortunes are but awaiting the bold strides and efforts of science, labour, and capital.

It is proposed as the groundwork of the enterprise, and in order to practically carry out the preliminary plan of operations, to arrange a syndicate for an Anglo-Foreign Mining, Smelting, and Promoters' Association (Limited), the first members of which will derive the whole of the emoluments attainable by the promotion of companies, with the aid of united capital, added to the acquisition of multiplied mines that will pay enormous dividends, more especially those situated in the isolated mountains of Peru and Mexico. Verily, indeed, there is no gainsaying the fact that in those remote regions mineral really does exist. Listen! take heed! solid silver itself is readily obtainable by the ton, the only requisitions being a little capital, with science combined, in the shape of practical smelting upon the spot. History and mining records inform us that long before America was discovered Peru helped chiefly to supply the world with silver, and yet even to the present day the operations in the more cultured districts, where wealth is proverbial, and silver is almost as common as copper in England, are conducted on the most primitive principles, the silver ores uncontaminated with much lead having to undergo the long expensive process of concentration by the use of mercury, after having been first subjected for weeks to the chlorination treatment of exposure in the sun with salt, and repeatedly turned over, in order to convert the sulphides into chlorides; but at the best, this plan is only partly effective, and whenever the silver contains much lead it is impossible to separate the precious metal only by smelting, which accounts for the immense revealed, yet hitherto unattainable, wealth of the first property I am about to introduce to the syndicate, and intend to be the mainpring, the very fulcrum itself, to make something worthy the name of a fortune for the instigator of the undertaking, and all those who assist in espousing the cause.

This property is situated several hundred miles from Lima, Peru, and produces as its recognised mineral product almost pure lead (an unmarketable commodity, and a pest to all silver miners who treat the ores chemically), but rich for silver, averaging 200 ozs. per ton; nevertheless, as the only means of transit is along the narrow rugged paths of mountains on the backs of mules, and the superabundance of lead prevents the adoption of the chlorination and mercury process, it has hitherto been regarded as utterly valueless, since the money product of the silver and lead together would be more than swallowed up by the cost of the conveyance of the material in its present state to any market. It is here that capital, science, energetic ambition, and labour, the quartette linked arm-in-arm together, have the opportunity to make their way, and score an indelible mark of success, for although the path is beset with some difficulties in getting the necessary materials to the mine for the erection of smelting works, it is upon a small starting scale, within the province of comparatively easy accomplishment, and the returns will well reward the required pluck and perseverance, for with a similar furnace to the one we have here, which only necessitates small motive power to drive the fan, and a refiner, 10 tons per 24 hours can and will be treated of this mineral, that in its present natural state of production has no commercial charm whatever. Let us pause and calmly calculate the value of only 10 tons per day of lead giving 200 ozs. silver per ton, and, reader, take courage, mind you this silver really exists; it is no mere hypothetical chimera, no idle day dream, no vain delusive hope, since, like Kent is noted for chalk, so is Peru famed for silver, and even where the surroundings are favourable less than 150 ozs. of silver per ton, if contaminated with lead, are treated with contempt and thrown aside as worthless. Of course under such circumstances it would be worse than folly to attempt to save the lead, which in England is generally worth considerably more than the precious metal it contains. Our one desideratum is to secure the silver only, and the blast furnace under skilled management, where in the mountains no heed need be taken of offensive vapours, with the aid of a high pressure jet of steam and other kindred modern appliances, will separate, destroy, and get rid of the lead, leaving the silver, after further being passed through a refining furnace, perfectly pure, and worth at least 5s. per ounce. Now, 10 tons at 200 ozs per ton will equal 2000 ozs., which at only 4s. per ounce gives the result of 4000l., or at least 3500l., per day profit, as the bounteous supply of the mineral causes the cost of mining to be light, especially where Peruvian Indian mountain labour is abundant and cheap; and when it comes to the transit of pure silver, no matter how rude, rough, or tedious are the roads, the transportation of the precious article, worth upwards of 6000l. per ton, can well afford a heavy expenditure incurred towards securing for it a market. This is quoted as merely one single instance of the estranged, wild, multitudinous, valuable mineral deposits in Peru, Mexico, and the United States that are only awaiting and are always ready to grasp the proffered hand of friendly intercourse, mingled with the power of capital and scientific researches to develop them, and, to my view of thinking, there is no policy so wise as the establishment of a strong company of promoters to carry the project into practical effect, where the reward will not be confined to 10, 20, 50, or 100 per cent. per annum interest on the investment, but by the acquisition of property after property, and the promotion of company after company, the profits will become practically unlimited in extent. The preliminary difficulties are considerably lessened by my personal acquaintance with some of the leading gentlemen of Lima, Peru, who are espousing the cause, and will render great assistance in the legal technicalities of securing properties, a most valuable adjunct; added to which the Peruvian Indians in the mountains are a mild, peaceable, primitive race, and if made worth their while will conduct us to numerous rich silver mines, as they have a life-long familiarity with the mineral deposits near the surface, or, directly smelting works are erected, we can treat with or purchase of them the richer silver ores they would mine on their own account in their own rough way, and from distances off bring to us for disposal. This will be a further additional source of revenue; indeed, words cannot describe, language cannot portray, and my pen cannot picture to the full extent of their merits the advantages that will accrue to the fortunate first investors, who will reap the full harvest of such an unprecedentedly prosperous enterprise.

This dissertation is already verging towards the voluminous, and yet not one half of the tale is told, not one tithe of the scheme is expounded, not more than one decimal fraction of the advantage to be derived is graphically and succinctly discussed, as would be my wish and aim, if you could only permit the space, but I must not encroach farther upon your kindness, and will draw to a close by informing your readers that I hope to be in London shortly after this appears in your columns, and until I can arrange City offices shall feel obliged if you will allow letters from old friends and new patrons to be addressed to me through your office, when it will give me pleasure to furnish any other desired information through the instrumentality of a printed circular, and by the aid of private correspondence, thereby enabling the whole programme to be more fully explained and commented upon, and affording the first comers not only the opportunity to use their will, but the way wherewith to secure the entire scope of emoluments, the very acme of prosperity—fortune itself, that cannot fail, by reason of intuition or natural instinct, to convince the most confirmed sceptic will be the ultimate reward, and meanwhile the sure means, by mutual strength and concerted harmony, of striking the "Key Note to Wealth."

THOS. J. BARNARD.

Peach Bottom Copper Mines, Elk Creek, Alleghany County, North Carolina, United States, March 4.

Letters to be addressed care of "Editor," Mining Journal, 26, Fleet-street, London, E.C.

VALUE OF MINES—MINING COMPANIES, AND THEIR FAILURES.

SIR,—I have not the pleasure of acquaintance with "Mining and Civil Engineer," at any rate I do not know him under his *nom de plume*, neither did I attach myself to his side because he required my assistance, for we have evidence enough he can hold his own. On the contrary, I desired to give my testimony to the accuracy of his calculations, to his courteous conduct, and, moreover, that in a discussion of this class I like to see fair play and truthful statements on either side, without which no good result can be arrived at. "A Careful Examiner" has denominated myself a friend of "Mining and Civil Engineer," and I answer that I am no more his friend than I should have been that of "A Careful Examiner," presuming the latter had adopted a proper mode in handling the subject, and likewise shown that his knowledge of the rule of valuation was sufficient to entitle him to be heard with respect.

I am far too old to allow of contentious feelings, but I have devoted many years of my life to mining in different parts of England, and also in foreign countries, and in the course of time I have invested a large amount of capital. Necessarily, many valuations have come into my hands, and I could write down a long list of gentlemen, engineers of great repute and experience from the Midland Counties, from Wales, from the North of England, and from Scotland, who have made such valuations, and I could safely state in a court of law, if it were necessary, that in no instance has it come to my knowledge that the engineers referred to allowed a less percentage upon the purchase of any coal or metalliferous mine than 20 per cent. That being so, I know from long experience in mining that "Mining and Civil Engineer" is perfectly accurate in the conclusions arrived at as to the amount of interest and resulting values. Were a foreign mine to be offered to me at the present time, having sufficient *bona fides* to justify its entertainment, I would not consent to become a purchaser and to pay down 120,000l., or 127,000l., unless more than 25 per cent. per annum were to be allowed upon such purchase, because the many difficulties and uncertainties of regular returns from such foreign mines would be much greater than from mines at home. I too examined the late prospectus of the Monte Catini Company, and as an independent judge, I considered that the sum demanded was much too high, and I have no doubt that many of those who generally subscribe to such undertakings thought as I did, and that was the reason at which, to my

mind, it proved a failure. I candidly confess I should not have been willing to pay 30,618l. for the mines, because that is the value at 25 per cent., according to the basis of "Mining and Civil Engineer," but as I should have required more than 25 per cent., the value would have been less. I believe that the Monte Catini Mines have seen their best days, and I also believe that if any gentleman was capable of calculating that the reserve of ore amounts to 6000 tons he would also have been able to have given at least a rough estimate of the quantity of ore likely to be extracted from the newer parts of the mine. If I had sent any of my own mining engineers to visit those mines I certainly should have expected to have seen in their reports to me the probable quantity of ore to be extracted from the mines.

If the lodes were well developed there would have been no difficulty in giving an estimate; but if they were only indications a great uncertainty as to the existence of ore; then I could understand the reason why a practical engineer would feel a delicacy in stating the quantity. But then we come to the question, should a mine be floated and the public asked to subscribe a very large sum of money when mines contain little more than mere indications of ore, or is an old mine nearly worn out? I have paid for my experience heavily, and I say the investors should be very careful in such matters; for it comes within my knowledge continually that large capital sums are spent upon mines from which it is impossible ever to expect any returns at all. A "Careful Examiner" has not dealt with this subject and with the figures of mining and civil engineers in such a way as to reflect credit to himself, and I would recommend that he should receive such a chastisement as untruthful men are entitled to receive; and I should think that you, Mr. Editor, would not allow such a person to write in the columns of your Journal who is unwilling to adhere strictly to the truth.—London, April 5. INVESTOR.

VALUATION OF MINES.

SIR,—"Engineer," in his "observations" in reply to "Mining and Civil Engineer," has, in a most marked and elaborate manner, depicted his ability (?) to value mines or any workings connected therewith. He should come out of his shell, and make himself known to the public, when, I have no doubt, he would be in great requisition by many interested in Indian mines, especially so as he resides in the midst of them all, or at least within, for India, an easy distance of them all; and as he seems to have their whole pedigree at his fingers ends, he could soon work up a good sensational report on any of them. I would advise him to be a little more careful in his figures and facts than he was in his letter in last week's Journal, or he might meet with some one to dispute them; but as his knowledge of the subject seems so very transparent, I will not now attempt to refute any of his statements, but let him rest in the full enjoyment of his evidently hard-earned laurels. I would advise "Engineer" to read well the history of Mysore, which he can obtain in Ootacamund. I have no doubt he will therein be able to obtain some information as to how, when, and why these old workings, which he states as being very extensive in several parts of Mysore, were made, and he will also find therein something to guide him in making statements as to the produce of these same old workings, and I will warrant him that, after reading what is stated therein, no sane man would ever think of wasting his money in searching for gold in the Colar district. Had "Engineer" have bought his prospecting experience as dearly as I have mine, he would very quickly have found out the futility of prospecting in the manner he describes, or even in any other manner, on the Great Southern Mysore claims; and I am very certain I never expressed to any one that I "actually expected to hit an auriferous reef at once over an area of 800 yards by a shaft 3 yards wide." Had I made such an expression I should certainly have concluded that I was a lunatic.

Birmingham.

CHARLES F. BRAY.

DIAMOND DRILL BORING MACHINES.

SIR,—Having looked over the present and past advertisements and letters in your always pre-eminent Journal for information concerning such instruments, and failing to find any mention of them, may I ask the favour of those who have used them to take the trouble to state through the Journal how they have found them to answer, their cost and merits. I am told they are much used in America.—Tavistock, April 4. W. S. LLOYD.

UTILISATION OF BLAST-FURNACE SLAG.

SIR,—There are probably few subjects which have been more fully discussed in the Journal than the utilisation of blast-furnace slag; but the result has, I am sorry to see, been so unsatisfactory that a practical man can even now put forward no better suggestion than a cheap means of throwing it into the sea, and wasting it. It is well known where the manufacture of pig-iron is conducted on a large scale the production of slag is so great that the disposal of it becomes a matter of considerable difficulty. As only a small proportion has been found available for profitable purposes the greater part is usually deposited on land, which is thereby depreciated in value. In some districts, however, the slag is now carried out to sea in barges with hopper bottoms, and there is sunk, and the invention of Mr. E. F. Jones, of Middlesborough, refers to this method of disposal. Instead of running the slag into thick blocks, as is now usual, he runs it into comparatively thin cakes of large horizontal area (say, conveniently about 12 in. thick by 6 ft. by 7 ft., more or less), in order that the slag may cool more rapidly by radiation, and may afterwards by the means hereinafter described be broken up. When it has become sufficiently cold he removes it in the bogies wherein it has been run to a tipping apparatus, leading to a shoot or inclined fixed hopper, which forms the boundary of the shipping wharf. Immediately below the tipping apparatus are knife-edged castings, on which he causes the cakes of slag to fall when it is tilted over, and thus the cakes are broken into fragments that fall down into the hopper or shoot. At the lower part of the shoot is a sluice or door, which can be raised, lowered, swung, or shut by machinery, which prevents the slags from falling out when it is closed.

In making an arrangement for this purpose a door which when closed stands in a vertical plane, or nearly so, is carried on pivots or trunnions. It is operated by apparatus worked by fluid pressure, and provided with the necessary valves, cocks, &c., whereby the said apparatus may be regulated so as to hold the door in a vertical or inclined position, accordingly as it is required to prevent or allow the passage of the slag. A bunker, hopper, or collecting-box is thus formed, in which a certain weight of slag can be stored when no barges are available for its removal. Hence it will be understood that the number of shoots employed and the cubic contents of each may be adapted to the service of the barges—that is to say, to the time occupied by the barges in their trips out to sea and home again. When a barge is moored alongside the contents of the bunker can be shot out quickly by merely raising or opening the sluice, after which the latter is closed, and the bunker is ready to be refilled. It is obvious that the barge service will be regulated in a great measure by the state of the tides, and that the height of the lower edge of the shoot above the surface of the water will of necessity vary very considerably, so that at times the shipping of the slag cannot be carried on. To in a measure obviate this difficulty he attaches to the lower edge of the shoot a hinged flap that forms a prolongation of the shoot capable of being raised or lowered, and of thus accommodating itself to the position of the barge as determined by the state of the tide.

Now, although this is a patented arrangement, it really appears to be a wanton destruction of a material which should be valuable. Slag bricks at one time promised to come largely into use, as Mr. Bodmer, I believe, showed that they could be produced more cheaply than common bricks, and were much more durable and beautiful. The great question which requires answering is whether the 1 ft. thick slag as run by Mr. Jones is as strong and as resistant against crushing forces as ordinary stock bricks as used by builders in London and the neighbourhood. I am convinced that it is, and that a very slight modification of Mr. Jones's invention would give us uniform blocks of slag 1 ft. thick and (say) 24 in. by 14 in. surface, which blocks I would propose to use as a damp-course in every house, and they would give us good dry villas without extra cost worth consideration. If slag were once introduced to builders its use would

be true as stated in telegrams and letters from India that the reefs there will yield 1 oz. per ton, it should give the shareholders in the Indian mines some heart to see the return from the North Glamire (£277 ozs. from 348 tons), as this claim is one of the steadiest dividend paying ones in Gypmie. Any reef over 2 ft. wide, yielding steadily about 1 oz. per ton, is a really good property, providing, of course, that it is properly worked and fuel and water are fairly plentiful:—

Gypmie.—Telegrams state that 200 tons of stone from No. 1 North Phoenix gave 577 ozs. This claim gave 1223 ozs. for six weeks' crushing, and has declared a dividend of 2s. Two fresh leaders, carrying excellent gold, have been struck in a short fortnight's crushing. The North Glamire obtained 277 ozs. for three weeks' crushing, and 80 ozs. from a new patch. The Phoenix Prospectors claim yielded 820 ozs. for a month's crushing; No. 1 North Glamire, 243. Monday's telegram reports that No. 1 North Glamire have declared a dividend of 2d.; No. 1 North Phoenix have declared 2s. per scrip. They have also struck two new leaders in sinking. They are small, but show nice gold: 348 tons from the North Glamire yielded 277 ozs. On Feb. 3 the Wellington tribute had cleaned up for 314 ozs. of gold, and St. Patrick No. 1 south for 917 ozs.

There have also been late discoveries of large galena lodes, rich in lead and silver, and also a proportion of gold, within a reasonable distance of Townsville, in Queensland, and the capital to work them is now being raised partly in Sydney and partly in Paris and Hamburg, as the continental capitalists are evidently more alive to the mineral wealth of these colonies than the English ones. R. D. A. Sydney, New South Wales, February.

RICHMOND CONSOLIDATED MINING COMPANY.

SIR,—The letter of your correspondent, "S. H.," in last week's Journal, and the paragraphs from the Eureka Leader which accompany it, have doubtless been read with interest by every one of your readers who has a stake in the Richmond Mine. The disclosures they reveal are already, we may presume, engaging the serious attention of the directors of that mine; but that a systematic course of robbery, such as is described in the Nevada Journal, should have been successfully prosecuted for such a length of time, without any suspicion of foul play having been excited in the minds of the executive, would seem to indicate a laxity of supervision on the part of the manager which at least requires explanation. The shareholders have perfect confidence, I believe, in Mr. Probert, nor would they wish in any way to curtail his occasional absences from his duties, which are necessary indeed for the maintenance of his health. At the same time it should be remembered that we no longer possess the invaluable services of Mr. Rickard, and that at the present moment there is no one on the spot who is qualified to undertake Mr. Probert's responsible duties during his temporary absence from the mine. It is, therefore, greatly to be desired that there should be no unnecessary delay in appointing a duly qualified officer in Mr. Rickard's room. I do not think the revelations now made public need cause any alarm to the shareholders, or that they are likely injuriously to affect the prospects of the mine. In one respect—and that an important one—they will rather benefit it, by showing that the falling off in the returns during the last few months has not been due, as some suppose, to a general deterioration in the Richmond ore, but mainly, if not entirely, to an organised system of robbery, by which the low grade ore of an adjoining mine has been interchanged, and to a very large extent, for a corresponding quantity of our best and richest ore. As the discovery of this conspiracy was only made on the 9th of last month, it is not likely that the Richmond board would be able to furnish much additional information to what is given by the Eureka Leader, so that the shareholders may have to wait a month or more for any official account of the affair. In the meantime, however, it would not be time misspent if the shareholders were to press upon the board, as a subject deserving of their careful consideration, the suggestion made at the close of your correspondent's letter that the Richmond Company should become the purchasers of the Albion Mine. The proposal is a bold one, and it is doubtful whether it would commend itself, at least on the terms stated, to the Richmond Executive, but no one can doubt that if the differences between the two mines could be adjusted on reasonable terms out of Court it would be a gain to both parties, but more especially so to the Richmond in its present circumstances. April 4. C. W. K.

RICHMOND CONSOLIDATED MINING COMPANY

SIR,—The Mining Journal of last week contained the only account I have seen published in England of the extensive frauds perpetrated by the tributers employed in the Richmond Mine, who have filched ore from the disputed Albion ground, and exchanged high grade ore for low, between the Richmond Mine and the Eureka Consolidated. A friend of mine in Eureka has sent me the Ruby Hill Mining News, which contains a full and clear account of the *modus operandi*, and of the motives which have influenced the tributers in carrying out their nefarious practices. As this account may interest your readers, I have enclosed the paragraphs for publication in this week's Mining Journal.

The article in question is prominently headed—The Big Steal—A pretty plan for pilfering—Crooked pranks underground—and How the Tricky Tributers Robbed Peter to pay Paul, and worked Albion, Richmond, and Eureka Consolidated, and goes on to say—the subject of the big steal in the Richmond and Albion Mines has been much talked of and commented on since its discovery, and the thorough unravelling of the case brings to light some interesting features. In order to thoroughly appreciate the situation, our reporter visited the scene of depredation on Saturday evening, and had an excellent opportunity to observe the results, and the *modus operandi* employed to compass the steal. Our first landing was at the sixth level, and from thence we were shown along the No. 1 fissure drift, which runs westerly, and direct for the Albion ground. This, be it understood, is an old and abandoned drift, and extends in the neighbourhood of 100 ft. to the point where the Albion is tapped. At the further end 80 ft. of the car track had originally been torn up, and close to the end a heavy bulkhead had been built, cutting off all communication with the Uncle Sam drift, in which the Albion ore was stored, and which communicated with the drift in question by means of a small shaft or upraise. The Uncle Sam drift was for a distance of at least 100 ft. piled full of the sacked Albion ore now held by litigation, and the ore richers conceived the brilliant and highly successful plan of stealing this ore from the Richmond side by means of tapping the pile from the rear and through the abandoned shaft, and delivering it through the old fissure drift referred to.

To accomplish this required some fine engineering, and not only that but a shrewd system of confederacy was necessary to escape detection in the scheme. The old drift was cleared, the 80 ft. of torn-up track replaced by material from another drift, and everything put in shape for running a car. The bulkhead at the end of the drift, which was made of heavy timbers, was removed, and a fine counterfeited it made. This admitted of a door being cut through, which, when not in use, was neatly closed and clayed up, so that no tell-tale draft of air would discover the opening, and to all appearances it was perfectly intact. Several feet of a false track approached the door, which being taken up would lead to the delusion that it did not have any connection beyond. The upraise beyond the bulkhead and at the end of the drift was blasted out, and a fine chute put in, which not only gave opportunity to remove the ore from, but served as an entrance to the store-house drift of the Albion. The mouth of this ore drift was so piled up and bulk-headed with sacks as to not discover the operations of the filchers behind, and everything, in fact, was most artfully concealed.

The sacked ore was emptied into the chute, and from there taken in cars over 1000 ft. along the fissure drift to the sixth station, and thence along the main sixth level to the private shute on the line between the Eureka Consolidated and Richmond. Here a very artful contrivance was arranged, which served a double purpose—to deliver not only the stolen Albion ore, but tribute ore from the Richmond into the Eureka Consolidated ground. In order to accomplish this end an upraise from the Eureka Consolidated of over 10 ft. was made. It could have been run through solid line and made to connect so accurately and perfectly with the Richmond above is a mystery, unless improved instruments were used to lay out the work. But it was done, and a very cunningly concealed shute opened at the side of the track in the Richmond drift. Down this private shute the carman dumped the stolen Albion ore. Immediately above this shute was a regular tribute chute which led from the "Little Pott's Chamber" above. The two could be thrown together, so that tribute ore could find its way into the Eureka Consolidated by the same route. When not in use the private hole was carefully planked over, and so concealed as to baffle detection.

In order to work unmolested, it is said that the cunning operators frequently chose Sundays as an opportune time, when the mine was closed down, and made their way into the ground by descending the old Marcellina shaft near the K K and working their way into the ground by means of the old ladders and galleries by a roundabout way through the K K, Eureka Consolidated, and Richmond. One place was shown as where a very hazardous climb had to be made through a deserted mine, by means of a rope, in order to make the trip. The place was a dangerous one and few but expert miners and old hands would attempt the passage by such a route. Aside from Sundays ample time was afforded the thieves by the aid of implicated watchmen, who made it convenient not to discover them, and the system of robbery went on smoothly and systematically. It is estimated that the Albion steal and the necessary arrangements to perfect it must have taken at least two or three months to accomplish. In the Uncle Sam drift, from which the ore was taken, a large space is cleared out, and 600 or 700 sacks piled up near the blind chute testify to the amount of ore pilfered. It is estimated at about 55 tons.

The fatal mistake made by the enterprising pilferers was that they unfor-

tunately struck the wrong end of the drift and secured nothing but low grade ore, which, if smelted at the Eureka Consolidated, would not have netted them more than \$4 or \$5 per ton at the most. Perhaps, if undisturbed they would have reached the high grade ore in time.

The first suspicion of the steal was on the Albion side, but it was so adroitly handled that the Richmond managers thought the possibility of its existence nearly absurd; but on this cue, no doubt, a quiet investigation was begun, which resulted in the exposure. The steal from the Albion is a bagatelle compared to the robberies that have been made from the Richmond and Eureka Consolidated Companies.

The point in these steals is covered by the fact that Eureka Consolidated pays a larger percentage on high grade tribute ore than the Richmond, and low grade ores bring more, or as much, at the Richmond. This state of facts brought about a regular systematised exchange of ores between tributers near the line. Not only has this exchange been carried on, but there have been numerous other greater riches. We were shown one case in which a company chute has been tapped from below, and the removal of a plank would allow company ore to escape into a tribute chute.

The ore exchangers, it is roughly estimated by some, have gotten away with at least \$40,000 or \$50,000 worth of ore, but it would be, in our estimation, difficult to form even an approximate idea of the amount. The principal exchange was no doubt made through the private chute referred to into Eureka Consolidated, while another chute on the seventh level furnished an outlet for ore from Eureka Consolidated into Richmond. Thus much is a description of the practical method of the steal, but, perhaps, the work of conspiracy was more ingenious and harder to arrange. We have it on good authority that there were no less than 20 or 25 persons in the ring.

It is a self-evident fact that no such extensive operations could have been carried on without the cognisance of more than one trusted employee of each company, and watchmen, carmen, and even higher officials were *per consequens* implicated in the affair, and, no doubt, several who were not active participants were silent accessories. It is not within our knowledge or province to disclose the names of several parties suspected of complicity, aside from the one or two of the apparent secret conspirators; but the matter will be thoroughly ferreted, and an exposition of the guilty parties throughout will come to light with investigation. The *onus* of the affair rests most heavily upon foreman Wm. Harris, whose inability to satisfactorily explain away these mysterious proceedings, if not implicating him, charges flatly a criminal neglect. To him was entrusted the supervision of the underground workings, and if he either knowingly or unknowingly permitted such flagrant practices he is guilty of a serious breach of trust. His subsequent resignation and departure point with strong suspicion to his guilt.

That the managers of either of the mines were implicated is not for a moment entering into our efforts that the matter has been brought to light. The whole affair was carried on through the duplicity of trusted servants and under-employees of the companies, or it could never have assumed such proportions. The plan throughout was an admirably conceived one, and the engineering of it showed some genius in the leader, whoever he may have been. Notwithstanding the perfect arrangements of the steal, the managers nipped the thing fairly in the bud, and put an early stop to the scheme.

A bench warrant has been issued for the arrest of Sam Reynolds on a charge of drawing a deadly weapon on Manager Probert, of the Richmond, during the late strike, and from the accounts the festive Samuel is far beyond the reach of Judge Rice's warrants, and will shortly be reveling in a land where naught but the inconvenient reach of the extradition laws could disturb him. Samuel, take care!

The position of shift boss made vacant at the Richmond by the promotion of Sam Longley has been accepted by John Masterson, one of our old-time miners and prospectors. John is a good square man, and a practical miner of long experience, and we are pleased to note his appointment. York, April 3.

THE SUPPLY OF GOLD.

SIR,—I have read with much pleasure the interesting and valuable contribution to this question by your correspondent, Mr. Del Mar, in last week's Mining Journal. When I wrote the letter which you were kind enough to insert in the same issue I certainly could not have anticipated that my remarks on this subject would be so strongly corroborated by a gentleman personally unknown to me, but one who is evidently well qualified, from extensive practical experience and knowledge, to speak with authority upon it; and I think it may be accepted as a generally acknowledged and indisputable fact that the supply of gold is, indeed, rapidly declining, while consumption and demand for it is getting greatly on the increase, which, apart altogether from the further greatly enlarged demand that will certainly take place so soon as a complete revival of commercial prosperity is experienced—is bringing about what Mr. Del Mar describes as a "critical condition of affairs, full of danger to the most important interests of society."

Mr. Del Mar has favoured your readers with a rapid yet comprehensive and masterly survey of the past and present sources of the supply of gold, and certainly the impression he conveys is not very encouraging for those who may be trusting to any considerable increase in the supply from the gold quartz mines which have yielded so largely during the 35 years that have elapsed since the discovery of gold in California. Geographical discovery and the search for gold have been prosecuted so energetically during that time in every quarter of the world that no very sanguine hopes can, perhaps, be now entertained of extensive alluvial deposits of that metal being discovered, except it may be from the still unexplored portions of Central Africa and other equally remote and as yet inaccessible regions. On gold quartz mining with improved appliances, and the extension of hydraulic mining in the gold fields now known, the chief reliance must, probably, be placed for that increased supply of gold which is now so urgently required.

Much interested in the question as a geologist, although I have never held a share in any gold mining company whatever, or having any connection with gold mining, I anticipate with much interest the further communication Mr. Del Mar has promised as to the quarters where the commercial world must look to obtain its future supplies of gold. In the meantime I may mention that being struck with the various notices of late in the Mining Journal and elsewhere of the large amount of gold obtained from El Callao Mine, in the province of Guayana, Venezuela, I have been reading the works of various travellers in that comparatively unknown, although very accessible country, and the impression produced on my mind has been that from that province there is every probability of supplies of gold being ere long got from it that shall rival those of California and Australia.

There is an abridgment of a most interesting paper by Dr. C. Le Neve Foster, on "The Caratal Gold Fields," and also notes on "The Geology of Guayana" by Prof. Ralph Tate, in which a description of the same district is given, both published in the "Proceedings of the Geological Society," June, 1869, to which I may refer those of your readers who are interested in the subject. From those well-known and reliable authorities I find that the auriferous area then known in the Caratal gold field is "about 12 square miles, the whole of which is traversed by gold-bearing quartz veins, averaging in thickness 2 to 3 ft., most of which have yielded visible gold in abundance." "The richness of some of the lodes," Tate says, "and of the placer digging of this auriferous tract, fully justifies the appellation of El Dorado, which has been given to it, and it may be the El Dorado that incited Raleigh to penetrate Venezuela, but which he failed to discover." Foster states that when he was there "the gold workings were comprised within a circle of 3½ miles, with Nueva Providencia as its centre," but besides that two American gentlemen had found gold on the River Paragua, and just before leaving he heard of the discovery of a lode of gold quartz in the hills to the south of Pastora. Gold had also been found at Upata, and Dr. Rassard, to whom the knowledge of the Caratal gold field is due, had informed him that a lode of auriferous quartz had been found on the banks of the Cuyuné river in British Guayana, all facts going to prove that the auriferous rocks in the district in question are spread over a very considerable area indeed.

I could quote other authorities, but, fearing to trespass too much on your space, interesting as the subject is, I shall here only further refer to the "Land of Bolivar," by James Mudie Spence, F.R.G.S., and member of the Alpine Club, whose beautifully illustrated volumes of travel and adventure in the Republic of Venezuela, published by Sampson Low and Co. in 1878, refers to the "rich and productive gold mines of Guayana, which prove that the dream of the early Spanish conquerors of El Dorado, the Land of Gold, were not an altogether baseless fabric." Spence quotes a paper on the minerals he collected during his travels in Venezuela, by Professor W. C. Williamson, F.R.S., and President of the Microscopical Section of the Literary and Philosophical Society of Manchester, which was read by him before that society on Jan. 27, 1873, in which Professor Williamson states that "Gold quartz of the richest kind came from the province of Guayana, where vast regions of auriferous rocks occur, and where gold is found in grains, flakes, and nuggets of all sizes, from an ounce to many pounds weight, in a clay from 2 to 8 in. thick, as well as in a red peroxidised iron earth, both probably alluvial drifts; and that the quartz veins of the district are also richly impregnated with gold in crystals and stringers."

The production of gold from the Callao (55,000 ozs. last year and

5115 ozs. in the month of January last) and Chile quartz reefs are only what might have been anticipated from the foregoing descriptions of the auriferous region of Guayana; and now that this country—rich in every sort of mineral and vegetable products, and in which, Spence states, that "the produce of a month's labour is amply sufficient to feed, clothe, and house the labourer and his family for a year," and in the mountainous districts of which the climate is remarkably healthy—is being opened up by the railways now in progress. I think I am warranted in directing the attention of your readers and all interested in this industry to the province of Guayana, in Venezuela, as probably one of, if not the most, important quarters from which future large supplies of gold can be obtained.—London, April 5. F. G. S.

THE KEY NOTE TO WEALTH—

ASSOCIATED FOREIGN MINING AND SMELTING,

Combined with the promotion of successful Public Mining Companies, which is the only direct short route, with limited means to acquire speedy colossal fortunes.

Revelations, and full explanations upon the above subject,

BY THOS. J. BARNARD.

SIR,—And, once again, after a lapse of years, during which time the writer has travelled and sojourned in many parts of the world, and passed through a few changes and scenes, your old regular correspondent, who at one time never failed with his weekly budget to espouse the cause of mining at home, and who during his peregrinations, has been but a looker on and stranger to your esteemed columns, which echo their sentiments into the most remote regions of the globe, and wherever the least vestige of mining exists sends you and your numerous readers greeting away across the ocean, from the Alleghany Mountains of North Carolina.

Yes! These lines are penned by one who, before trying his fortune abroad, devoted years to the cause of mining in England, not merely in one degree, but in all its many phases, sometimes as a private proprietor and worker of mines, at other periods as a promoter of companies; again, as an inventor and patentee for the concentration of poor ores—indeed, few in England ever worked more hard to achieve a legitimate success, or collected together and spent larger sums of money, for the wealth of English mining than the writer, whose name was once as familiar as household words with capitalists, merchants, agents, workpeople, and one and all interested in the welfare of home mining. This is not mentioned as an egotistical parade, and the sincerity of the assertion will soon dawn upon your readers as they further peruse the subject, but it is necessary to narrate these facts *en passant* in order to arrive at the desired point in the proposed explanations of "The Key Note to Wealth."

Forsooth! Who does not recollect the spacious offices in Palmerston Buildings, with its staff of clerks, conducted by your humble servant, and representing several prominent and well-known mines, which directly their guiding hand and the aid of capital was withdrawn from them passed into obscurity!

Again, who does not recollect the rocks of copper and specimens of silver ore on exhibition, the occasional products of these mines, always enticing, or, as they say in Cornwall, "Keenly and slogging! And still again, who does not recollect, the cynosure of all eyes, the tandem team that was driven by its owner to and from business, the whole surroundings attached thereto being indicative of wealth, unfortunately derived only from promotion emoluments, and not by the stability and lasting wealth of rich mines. Alas! no! for let us look into the sequel and ask, What was the final result? Echo answers, result! nothing but signal ruin, inglorious defeat. And why? simply because the mines were not a commercial success, simply because instead of affording support, from the very alpha to the omega they had to be supported, and, *O tempora! O mores!* the same must unfortunately be said of the generality of home mines. Now let it be fairly understood this is no attempt to cry down England or English mines. "Speak well of the bridge that carries you across safely." Bless dear old England—given riches, it is the first and best country of the wide, wide world; and bless dear old Devon and Cornwall, with their always some vivid pleasant remembrances; but facts are facts, and many of your readers, as capitalists, have no doubt drained the bitter cup to its very dregs by unsuccessful home mining investments, whilst others, as promoters, know what a thankless task it is to pioneer several mines requiring large amounts every month to meet the pay-sheets—in fact, it is impossible to conceive a worse task than having to pilot a plurality of mines at one time, not exactly absolute failures, but utterly devoid of any commercial success, by reason of their only contributing, from the production of mineral, about 250*l.* to every 1000*l.* of their working expenses; but let it also be admitted that the conduction of an office in the City of London, where dividends and not calls are the order of the day, where eulogies and thanks take the place, to use mild terms, of lamentations and hard words, such, indeed, is a perfect elixir of blissful content and repose, the very acme and elysium of gratified ambition; and there is at least one who can speak feelingly, by dint of having passed through the respective seasons in their best and worst forms. Yes! it is not the dearth of money, knowledge, brains, pluck, or perseverance that causes the short list of dividend-paying mines in England, for there is certainly no lack of these essentials. But let us review the scenes of last year; it is the old old tale which repeats itself over and over again. After a rather long lull, an extended period of depression, when so many thought that English mining was ended for ever, came a perfect *furor*, and company after company was launched, with what result is now well known, and comments are needless, nevertheless, periodically the same rage will go on in the old country for at least generations to come, albeit the dividend mines may be counted on the fingers of one hand. About 18 months ago a message came from across the sea, several prominent men by deputation having requested the writer to return and take the lead in forming several companies to rework some old mines, but it was declined, for what is the use of labouring hard to lose money? Well, granted! admitted it is quite true that promoters as a rule come out unscathed and with profits, even when the enterprise is a failure, still, on the other hand, how much larger and more lasting are the benefits derived from a real success, added to the smiles and blessings which always accompany prosperity and fortune?

What will some of your readers say to this? I maintain that at the present moment it would be easy enough for me to return to England, secure the lease of a Cornish mine (there are scores to select from), and in a few weeks raise thousands of pounds to work the property—yea, far more easy than by the aid of the capital raised to find sufficient mineral to pay costs, for the last named is almost an impossibility, the odds against being too great, whilst the art of promoting a company, and collecting together thousands of pounds, is confined to the starting capital of a few 5*l.* notes, combined with the knowledge required, and added to tact, pluck, and perseverance when the reward of success is sure to follow; that is, so far as the raising of the money is concerned, but genuine real promoters, as a rule are born intuitively as it were to the business, and possess great ambition, hence they never attempt to float any mining company without having unbounded faith, whether misplaced or not, in its success, which accounts for their sometimes being worth 50,000*l.* and at other epochs realising the want of a 50*l.* note, for such a speculator is genuine, and knows no bounds, if there is any remote prospect of good luck, and will cheerfully sacrifice everything—his horses, carriages, pet tandem, articles of vertu, and all belongings, and sell the very bed from under him, with an outward unflinching composure, to be all swallowed up underground, since hope need never be entirely shut out, as it is always open for one lucky stroke of the pick, to be the means of redeeming lost wealth with compound interest; and that fortunes are sometimes made even in Cornish mines, where so many failures are proverbial, is proved beyond doubt by the statistics of the past, more especially in the good old days of yore.

Nothing could have induced me to leave dear Old England but the inability to command success upon its shores, and words cannot describe to those who were not taking a part in this particular drama of life, the never-ceasing persevering efforts that were made to deserve it, but all was useless, of no avail, and with the combined aid of the first amongst the most practical Cornish mining capitalists of the day

who were the quintessence of zeal and ability, and had but to ask to have the necessary means for carrying into effect any desired project: still with these and other kindred advantages the lottery of English mining, so far as the writer was concerned, ended in drawing many blanks, and no prize. However, perhaps all is for the best; it may have been as the Turks call it, "kismet," or fate, and certainly the opportunity has in consequence been presented to test for oneself the statements of mineral wealth heralded from the New World, as also from Peru, Mexico, &c.

Methinks your readers will exclaim, Well, what of these countries? and the response is, the old adage stands good for all time and places, "All is not gold that glitters." Frequently, after travelling hundreds, and in some cases thousands, of miles in company with Cornish mining captains, most experienced men, to inspect the reported treasures, ocular demonstrations have been too convincing that many of the vaunted El Dorados are but mere myths; but it must also, on the other hand, be confessed that by extended perambulations, and diligently seeking, untold wealth may be and is revealed, more especially in the isolated mountains, unknown to fame, where civilisation is at its minimum, and the mineral developments are in a mere embryo form, or have been conducted on the most primitive principles—in a word, where the exceptionally bad roads for transit, and the distance from any market for the ores, is too great in such cases to admit of the required commercial success centered in that vitally important business talisman, *easy profit*.

Of course, there are on this side of the Atlantic rich mines on the market, where the surroundings are *comme il faut*, proved mines of considerable revealed wealth, and with great promises for the future, but for such fabulous prices are asked, \$250,000 or 50,000, being considered a mere bagatelle. But fortunes are never or rarely realised by exchanging fortunes to secure them—nay, indeed, they must either come by lucky inheritance, acquired by birth or gift, or through the means of a spirited *coup de main*. The buying cheap and when possible selling dear policy in any business will accomplish this object, given time and scope enough, but to successful mining alone is reserved the palm which "takes the cake," for the sudden accession of comparative poverty to superlative wealth, since a few pounds outlay, by the sudden discovery sometimes of great mineral wealth in a new district, lead at once to immense riches.

It is no uncommon occurrence whilst travelling through the mining regions of the United States to occasionally come across and often hear of men worth their hundreds of thousands of dollars who commenced with nothing but their heads and hands; still, of course, these cases are somewhat exceptional. But time runs on, and we will without further preamble come to the object in view, and endeavour to explain how by the aid of diplomacy, which can be brought to bear upon the matter, and with a little outlay, a few of your readers may join me in a project by which we cannot lose, are sure to win largely in any case, and if only one or two of the properties themselves turn out prizes—an almost absolute certainty—we shall amass colossal fortunes. The foregoing reservation is made not with any implied doubt, as will be seen by the sequel to follow, but mining is always a speculation more or less, whereas the promotion of companies rarely fails in any case to reap large emoluments, and with the real success of the companies promoted princely results are sure to follow.

Just a word or two respecting these mines from whence I now hail, although they are not for sale, but merely as instances of what may be accomplished in other mining regions, of which there are hundreds far richer, and some with greater beneficial surroundings. It is now over 50 years ago since the first discovery of mineral was made here, but owing to the world-wide usual drawback—viz., a preponderance of low class ore against a limited quantity of rich material added to the nearest market, Baltimore, being upwards of 400 miles distant, the first 45 miles to the railway station passing over to this day the most diabolical road imaginable, no efforts were made to vigorously work them, as a commercial success was consequently hitherto out of the question, until Capt. Joseph Tregellas, George Page, and I appeared upon the scene some 15 months ago. The properties are now owned chiefly by a few Baltimore capitalists, and bid fair to be some of the first dividend-paying copper mines in the States. The secret of success is very simple—viz., concentration by smelting—first there is a small quantity of rich ore that will assay 40 to 50 per cent., but the whole vein or lode, which is 10 feet wide, averages only 5 per cent., still it is at this point of low-class quality where lies the mainspring of the whole enterprise, since the quantity exists, which is easily dressed to 10 to 12 per cent., and then passed into the smelting works situated within a few yards of the dressing floors. The transit of coal to the mine for the blast and other furnaces would be worse than conveying the low-class ores to market, and a commercial failure must inevitably follow such a course if pursued; but instead of coal nature has been lavish with a profuse abundance of timber, which is converted into charcoal by contract, and delivered in the charcoal house close to the furnaces for a ridiculously low rate, 4 cents, or 2d. per bushel, but the coloured element, or negroes, who make this part of the business a speciality, earn good wages at such prices, 3s. to 4s. per day, considering that edibles here in the mountains are very cheap—beef and mutton 2d. to 3d. per lb., eggs 4d. to 5d. per dozen, fowls 5d. to 6d. each, and other requisitions of consumption at equally low rates. We have Capt. Joseph Tregellas to act as head agent and superintend the working of the mines, with several other Cornish captains and miners to take the lead underground in carrying out the same, whilst the coloured race, who work well when under guidance, form the main source from whence the supply of manual labour is derived. The smelting works are conducted by Mr. Thomas James, a Welsh smelter, who was for 15 years with one of the first smelting firms in America, Messrs. Pope, Cole and Co., Baltimore, and who has also had considerable experience in Mexico, &c., his younger days being passed, and ground-work of knowledge gained, across the Atlantic, in the neighbourhood of his birth, at the renowned smelting works of Llanelly. These apparently digressive descriptions may appear somewhat irrelevant to the explanation of the subject, but they are mentioned with a set purpose, as I wish to convince your readers that apart from the old proverb "necessity is the mother of invention," and having myself had unusual opportunities to practically master all the details and become acquainted with foreign mining and also smelting, I have it within my province to command all the elements of knowledge from experienced men, who will proceed at my wish to pioneer and assist in developing any of the unexplored districts, where fortunes are but awaiting the bold strides and efforts of science, labour, and capital.

It is proposed as the groundwork of the enterprise, and in order to practically carry out the preliminary plan of operations, to arrange a syndicate for an Anglo-Foreign Mining, Smelting, and Promoters' Association (Limited), the first members of which will derive the whole of the emoluments attainable by the promotion of companies, with the aid of united capital, added to the acquisition of multiplied mines that will pay enormous dividends, more especially those situated in the isolated mountains of Peru and Mexico. Verily, indeed, there is no gainsaying the fact that in those remote regions mineral really does exist. Listen! take heed! solid silver itself is readily obtainable by the ton, the only requisitions being a little capital, with science combined, in the shape of practical smelting upon the spot. History and mining records inform us that long before America was discovered Peru helped chiefly to supply the world with silver, and yet even to the present day the operations in the more cultured districts, where wealth is proverbial, and silver is almost as common as copper in England, are conducted on the most primitive principles, the silver ores uncontaminated with much lead having to undergo the long expensive process of copellation by the use of mercury, after having been first subjected for weeks to the chlorination treatment of exposure in the sun with salt, and repeatedly turned over, in order to convert the sulphides into chlorides; but at the best, this plan is only partly effective, and whenever the silver contains much lead it is impossible to separate the precious metal only by smelting, which accounts for the immense revealed, yet hitherto unattainable, wealth of the first property I am about to introduce to the Syndicate, and intend to be the mainspring, the very fulcrum itself, to make something worthy the name of a fortune for the instigator of the undertaking, and all those who assist in expending the cause.

This property is situated several hundred miles from Lima, Peru, and produces as its recognised mineral product almost pure lead (an unmarketable commodity, and a pest to all silver miners who treat the ores chemically), but rich for silver, averaging 200 ozs. per ton; nevertheless, as the only means of transit is along the superabundant paths of mountains on the backs of mules, and the superabundance of lead prevents the adoption of the chlorination and mercury process, it has hitherto been regarded as utterly valueless, since the money product of the silver and lead together would be more than swallowed up by the cost of the conveyance of the material in its present state to any market. It is here that capital, science, energetic ambition, and labour, the quartette linked arm-in-arm together, have the opportunity to make their way, and score an indelible mark of success, for although the path is beset with some difficulties in getting the necessary materials to the mine for the erection of smelting works, it is upon a small starting scale, within the province of comparatively easy accomplishment, and the returns will well reward the required pluck and perseverance, for with a similar furnace to the one we have here, which only necessitates small motive power to drive the fan, and a refiner, 10 tons per 24 hours can and will be treated of this mineral, that in its present natural state of production has no commercial charm whatever. Let us pause and calmly calculate the value of only 10 tons per day of lead giving 200 ozs. silver per ton, and, reader, take courage, mind you this silver really exists; it is no mere hypothetical chimera, no idle day dream, no vain delusive hope, since, like Kent is noted for chalk, so is Peru famed for silver, and even where the surroundings are favourable less than 150 ozs. of silver per ton, if contaminated with lead, are treated with contempt and thrown aside as worthless. Of course under such circumstances it would be worse than folly to attempt to save the lead, which in England is generally worth considerably more than the precious metal it contains. Our one desideratum is to secure the silver only, and the blast furnace under skilled management, where in the mountains no heed need be taken of offensive vapours, with the aid of a high pressure jet of steam and other kindred modern appliances, will separate, destroy, and get rid of the lead, leaving the silver, after further being passed through a refining furnace, perfectly pure, and worth at least 4s. per ounce. Now, 10 tons at 200 ozs. per ton will equal 2000 ozs., which at only 4s. per ounce gives the result of 400l., or at least 350l., per day profit, as the bounteous supply of the mineral causes the cost of mining to be light, especially where Peruvian Indian mountain labour is abundant and cheap; and when it comes to the transit of pure silver, no matter how rude, rough, or tedious are the roads, the transportation of the precious article, worth upwards of 6000l. per ton, can well afford a heavy expenditure incurred towards securing for it a market. This is quoted as merely one single instance of the estranged, wild, multitudinous, valuable mineral deposits in Peru, Mexico, and the United States that are only awaiting and are always ready to grasp the proffered hand of friendly intercourse, mingled with the power of capital and scientific researches to develop them, and, to my view of thinking, there is no policy so wise as the establishment of a strong company of promoters to carry the project into practical effect, where the reward will not be confined to 10, 20, 50, or 100 per cent. per annum interest on the investment, but by the acquisition of property after property, and the promotion of company after company, the profits will become practically unlimited in extent. The preliminary difficulties are considerably lessened by my personal acquaintance with some of the leading gentlemen of Lima, Peru, who are espousing the cause, and will render great assistance in the legal technicalities of securing properties, a most valuable adjunct; added to which the Peruvian Indians in the mountains are a mild, peaceable, primitive race, and if made worth their while will conduct us to numerous rich silver mines, as they have a life-long familiarity with the mineral deposits near the surface, or, directly smelting works are erected, we can treat with or purchase of them the richer silver ores they would mine on their own account in their own rough way, and from distances off bring to us for disposal. This will be a further additional source of revenue; indeed, words cannot describe, language cannot portray, and my pen cannot picture to the full extent of their merits the advantages that will accrue to the fortunate first investors, who will reap the full harvest of such an unprecedentedly prosperous enterprise.

This dissertation is already verging towards the voluminous, and yet not one half of the tale is told, not one tithe of the scheme is expounded, not more than one decimal fraction of the advantage to be derived is graphically and succinctly discussed, as would be my wish and aim, if you could only permit the space, but I must not encroach further upon your kindness, and will draw to a close by informing your readers that I hope to be in London shortly after this appears in your columns, and until I can arrange City offices shall feel obliged if you will allow letters from old friends and new patrons to be addressed to me through your office, when it will give me pleasure to furnish any other desired information through the instrumentality of a printed circular, and by the aid of private correspondence, thereby enabling the whole programme to be more fully explained and commented upon, and affording the first comers not only the opportunity to use their will, but the way wherewith to secure the entire scope of emoluments, the very acme of prosperity—fortune itself, that cannot fail, by reason of intuition or natural instinct, to convince the most confirmed sceptic will be the ultimate reward, and meanwhile the sure means, by mutual strength and concerted harmony, of striking the "Key Note to Wealth."

THOS. J. BARNARD.

Peach Bottom Copper Mines, Elk Creek, Alleghany County, North Carolina, United States, March 4.

Letters to be addressed care of "Editor," Mining Journal, 26, Fleet-street, London, E.C.

VALUE OF MINES—MINING COMPANIES, AND THEIR FAILURES.

SIR,—I have not the pleasure of acquaintance with "Mining and Civil Engineer," at any rate I do not know him under his *nom de plume*, neither did I attach myself to his side because he required my assistance, for we have evidence enough he can hold his own. On the contrary, I desired to give my testimony to the accuracy of his calculations, to his courteous conduct, and, moreover, that in a discussion of this class I like to see fair play and truthful statements on either side, without which no good result can be arrived at. "A Careful Examiner" has denominated myself a friend of "Mining and Civil Engineer," and I answer that I am no more his friend than I should have been that of "A Careful Examiner," presuming the latter had adopted a proper mode in handling the subject, and likewise shown that his knowledge of the rule of valuation was sufficient to entitle him to be heard with respect.

I am far too old to allow of contentions feelings, but I have devoted many years of my life to mining in different parts of England, and also in foreign countries, and in the course of time I have invested a large amount of capital. Necessarily, many valuations have come into my hands, and I could write down a long list of gentlemen, engineers of great repute and experience from the Midland Counties, from Wales, from the North of England, and from Scotland, who have made such valuations, and I could safely state in a court of law, if it were necessary, that in no instance has it come to my knowledge that the engineers referred to allowed a less percentage upon the purchase of any coal or metalliferous mine than 20 per cent. That being so, I know from long experience in mining that "Mining and Civil Engineer" is perfectly accurate in the conclusions arrived at as to the amount of interest and resulting values. Were a foreign mine to be offered to me at the present time, having sufficient *bona fides* to justify its entertainment, I would not consent to become a purchaser and to pay down 120,000l., or 127,000l., unless more than 25 per cent. per annum were to be allowed upon such purchase, because the many difficulties and uncertainties of regular returns from such foreign mines would be much greater than from mines at home. I too examined the late prospectus of the Monte Catini Company, and as an independent judge, I considered that the sum demanded was much too high, and I have no doubt that many of those who generally subscribe to such undertakings thought as I did, and that was the reason at which, to my

mind, it proved a failure. I candidly confess I should not have been willing to pay 30,618l. for the mines, because that is the value at 25 per cent., according to the basis of "Mining and Civil Engineer," but as I should have required more than 25 per cent., the value would have been less. I believe that the Monte Catini Mines have seen their best days, and I also believe that if any gentleman was capable of calculating that the reserve of ore amounts to 6000 tons he would also have been able to have given at least a rough estimate of the quantity of ore likely to be extracted from the newer parts of the mine. If I had sent any of my own mining engineers to visit those mines I certainly should have expected to have seen in their reports to me the probable quantity of ore to be extracted from the mines.

If the lodes were well developed there would have been no difficulty in giving an estimate; but if they were only indications a great uncertainty as to the existence of ore; then I could understand the reason why a practical engineer would feel a delicacy in stating the quantity. But then we come to the question, should a mine be floated and the public asked to subscribe a very large sum of money when mines contain little more than mere indications of ore, or is an old mine nearly worn out? I have paid for my experience heavily, and I say the investors should be very careful in such matters; for it comes within my knowledge continually that large capital sums are spent upon mines from which it is impossible ever to expect any returns at all. A "Careful Examiner" has not dealt with this subject and with the figures of mining and civil engineers in such a way as to reflect credit to himself, and I would recommend that he should receive such a chastisement as untruthful men are entitled to receive; and I should think that you, Mr. Editor, would not allow such a person to write in the columns of your Journal who is unwilling to adhere strictly to the truth.—London, April 5. INVESTOR.

VALUATION OF MINES.

SIR,—"Engineer," in his "observations" in reply to "Mining and Civil Engineer," has, in a most marked and elaborate manner, depicted his ability (?) to value mines or any workings connected therewith. He should come out of his shell, and make himself known to the public, when, I have no doubt, he would be in great requisition by many interested in Indian mines, especially so as he resides in the midst of them all, or at least within, for India, an easy distance of them all; and as he seems to have their whole pedigree at his fingers' ends, he could soon work up a good sensational report on any of them. I would advise him to be a little more careful in his figures and facts than he was in his letter in last week's Journal, or he might meet with some one to dispute them; but as his knowledge of the subject seems so very transparent, I will not now attempt to refute any of his statements, but let him rest in the full enjoyment of his evidently hard-earned laurels. I would advise "Engineer" to read well the history of Mysore, which he can obtain in Ootacamund. I have no doubt he will therein be able to obtain some information as to how, when, and why these old workings, which he states as being very extensive in several parts of Mysore, were made, and he will also find therein something to guide him in making statements as to the produce of these same old workings, and I will warrant him that, after reading what is stated therein, no sane man would ever think of wasting his money in searching for gold in the Colar district. Had "Engineer" have bought his prospecting experience as dearly as I have mine, he would very quickly have found out the futility of prospecting in the manner he describes, or even in any other manner, on the Great Southern Mysore claims; and I am very certain I never expressed to any one that I "actually expected to hit an auriferous reef at once over an area of 800 yards by a shaft 3 yards wide." Had I made such an expression I should certainly have concluded that I was a lunatic.

Birmingham.

CHARLES F. BRAY.

DIAMOND DRILL BORING MACHINES.

SIR,—Having looked over the present and past advertisements and letters in your always pre-eminent Journal for information concerning such instruments, and failing to find any mention of them, may I ask the favour of those who have used them to take the trouble to state through the Journal how they have found them to answer, their cost and merits. I am told they are much used in America.—Tavistock, April 4. W. S. LLOYD.

UTILISATION OF BLAST-FURNACE SLAG.

SIR,—There are probably few subjects which have been more fully discussed in the Journal than the utilisation of blast-furnace slag; but the result has, I am sorry to see, been so unsatisfactory that a practical man can even now put forward no better suggestion than a cheap means of throwing it into the sea, and wasting it. It is well known where the manufacture of pig-iron is conducted on a large scale the production of slag is so great that the disposal of it becomes a matter of considerable difficulty. As only a small proportion has been found available for profitable purposes the greater part is usually deposited on land, which is thereby depreciated in value. In some districts, however, the slag is now carried out to sea in barges with hopper bottoms, and there is sunk, and the invention of Mr. E. F. Jones, of Middlesborough, refers to this method of disposal. Instead of running the slag into thick blocks, as is now usual, he runs it into comparatively thin cakes of large horizontal area (say, conveniently about 12 in. thick by 6 ft. by 7 ft., more or less), in order that the slag may cool more rapidly by radiation, and may afterwards by the means hereinafter described be broken up. When it has become sufficiently cold he removes it in the bogies wherein it has been run to a tipping apparatus, leading to a shoot or inclined fixed hopper, which forms the boundary of the shipping wharf. Immediately below the tipping apparatus are knife-edged castings, on which he causes the cakes of slag to fall when it is tilted over, and thus the cakes are broken into fragments that fall down into the hopper or shoot. At the lower part of the shoot is a sluice or door, which can be raised, lowered, swung, or shut by machinery, which prevents the slags from falling out when it is closed.

In making an arrangement for this purpose a door which when closed stands in a vertical plane, or nearly so, is carried on pivots or trunnions. It is operated by apparatus worked by fluid pressure, and provided with the necessary valves, cocks, &c., whereby the said apparatus may be regulated so as to hold the door in a vertical or inclined position, accordingly as it is required to prevent or allow the passage of the slag. A bunker, hopper, or collecting-box is thus formed, in which a certain weight of slag can be stored when no barges are available for its removal. Hence it will be understood that the number of shoots employed and the cubic contents of each may be adapted to the service of the barges—that is to say, to the time occupied by the barges in their trips out to sea and home again. When a barge is moored alongside the contents of the bunker can be shot out quickly by merely raising or opening the sluice, after which the latter is closed, and the bunker is ready to be refilled. It is obvious that the barge service will be regulated in a great measure by the state of the tides, and that the height of the lower edge of the shoot above the surface of the water will of necessity vary very considerably, so that at times the shipping of the slag cannot be carried on. To in a measure obviate this difficulty he attaches to the lower edge of the shoot a hinged flap that forms a prolongation of the shoot capable of being raised or lowered, and of thus accommodating itself to the position of the barge as determined by the state of the tide.

Now, although this is a patented arrangement, it really appears to be a wanton destruction of a material which should be valuable. Slag bricks at one time promised to come largely into use, as Mr. Bodmer, I believe, showed that they could be produced more cheaply than common bricks, and were much more durable and beautiful. The great question which requires answering is whether the 1 ft. thick slag as run by Mr. Jones is as strong and as resistant against crushing force as ordinary stock bricks as used by builders in London and the neighbourhood. I am convinced that it is, and that a very slight modification of Mr. Jones's invention would give us uniform blocks of slag 1 ft. thick and (say) 8 in. by 14 in. surface, which blocks I would propose to use as a dampcourse in every house, and they would give us good dry villas without extra cost worth consideration. If slag were once introduced to builders its use would

soon extend, and soon the weather side of all suburban villas would be built entirely of slag, if not the whole carcass. ARCHITECT.
Bromley, April 3.

INDIAN QUEEN'S AND PARKA CONSOLS.

SIR.—The shareholders of Indian Queens Consols and Parka Consols have been asked to take further shares in the two companies which were unallotted. Somehow they do not respond well to the appeal of the directors. Yet the properties are of value, and little more capital is required to put them in a paying condition. There is good machinery and everything in capital condition. Let me urge upon my fellow shareholders to assist the directors, and they will save our property from complete loss. It is a valuable mine, but all is lost if we do not assist one another.
Bath, April 5.

NORTH ALFRED CONSOLS.

SIR.—I am of the same opinion as Mr. John McDermott, who wrote in the Supplement of last week's Journal, that it is high time shareholders in this company bestirred themselves to know what is going on at the mine, and how our money is being spent. It is now twelve months since I took a lot of shares in the company, and up to this date have received no notice of meetings of any kind, have also wrote to the secretary of the mine several times, but received no reply at all.—April 3.

PARYS MOUNTAIN COPPER MINE.

SIR.—I should be glad to learn through the *Mining Journal* whether it be a fact that gold to the extent of 6 dwts. per ton has been found in the millions of tons of halvans now at the mine, quarried out since the days of Queen Elizabeth, and, what is more, said to be extracted at a cost of 2s. per ton. I hear this has already been done on a small scale by a new process of a most wonderfully scientific kind. This ought to be bright news for the company, assuming, of course, that there is something in the extraction process. Of course the percentage of copper in these halvans (although not enough to pulverise and make it pay) could be easily extracted at a profit when once smashed up in the process for extracting gold. Port Phillip rejoices in 5 dwts., and makes about 5 per cent. profit on 100%, and at this percentage per ton, working on a far more expensive plan in the method of extraction, besides the enormous cost in wages in Australia in digging and mining for ores where all is ready at the expense of past shareholders. Who is able to calculate profits on such a basis? I should be glad to learn whether this wonderful and satisfactory news as to the possibility of extracting gold from the Parys Mountain ores is likely to increase the value of the property and the prospect of dividends, or whether it is merely like the nascent silver process at the Prince of Wales, to which the same parties attached equal importance, although every living chemist and most practical men well knew that it would be what it subsequently proved.
City, April 1.

MINING IN THE VOR DISTRICT.

SIR.—I remember the mining activity of the year 1825, when nearly every piece of land containing a lode or near to a mine in this district was taken up for working or to "sell." There was at that time what people call a "rage" for mines, but rages are of short duration as we found last year. People have resumed their sober senses again, and what they do now is done coolly and considerately. And in such a condition of mind they take care to select properties in which to invest their spare cash which are likely to yield interest for their money. There are in this district several mines of this character, amongst the rest the New Wheal Vor, Great East Vor, and Polcrebo. Of the two former I wrote you a few weeks ago, stating the good prospects presented by the discoveries of tin at shallow levels. Of the latter, I wish to say a few words. Although Polcrebo is in Crowan, I claim the mine for Wheal Vor district, because of its proximity to Breage, in which Wheal Vor is situated, and because the principle lodes are said by mine agents to be the same as those in Great Work Mine, where they have yielded 200,000% profit; which mine is now being worked by Capt. Teague, of Tincroft. Polcrebo is a tin mine of the most promising character, and likely to give dividends at an early date. A company is now being formed to develop the lodes, which are known to be valuable, but which the late company had not the means of working, and were, therefore, compelled to relinquish. The present promoters have issued a prospectus, from which I find that the number of shares is 3000, on which the first call will be only 5s. per share, and afterwards, if necessary, the calls will be four-monthly. There is a good 40 in. pumping engine on the mine ready for operation, which has been purchased, and possession of the mine obtained, for 250%, the vendors taking that amount in shares. This is a really legitimate undertaking of the ancient style, no premium being charged for the property as is now generally done in properties of less value. The mine is shallow—about 60 fathoms below adit, if I mistake not—and there are several virgin lodes in the sett warranting exploration, besides the main lodes. The management is entrusted to a very intelligent agent, Capt. W. H. Martin, of Merther Cottage, Sithney, near Helston, late of Wheal Coates. I have been informed that a large portion of the shares has been taken up by gentlemen of the neighbourhood, which is a proof of their confidence of success. The secretary of the company is Mr. W. Battye, of Winchester-street, London.
Truro, April 6.

LIQUID FUEL FOR FURNACES.

The opinion that liquid fuel could be advantageously substituted for coal and coke in furnaces was a few years since very general, and it appears that there are still those who are sanguine enough to hope that petroleum may yet be utilised as fuel, although it is now proposed to use the liquid for assisting combustion only. Messrs. Litchfield and Renshaw, of Cohasset, Massachusetts, propose an improved apparatus for burning the hydrocarbon fluid to eliminate therefrom the greatest possible heat, and then to deliver the resulting gases along or across the furnace in which they are to be consumed. They may mix hydrocarbon fluids with steam or air, or both, and then force the same through a rotating or revolving perforated pipe or pipes into a combustion chamber, where they are ignited, and used either alone or in connection with an ordinary fire of coal or other fuel; or they mix hydrocarbons with steam, or steam and air, in a suitable chamber, and force the same through a stationary nozzle into a combustion chamber, the said nozzle being so constructed as to deliver the said steam and air, when mixed with the hydrocarbon, in a whirling and converging stream, in order that the atoms may be focalised and forced against each other in such a manner as to ensure their thorough mixture and complete combustion.

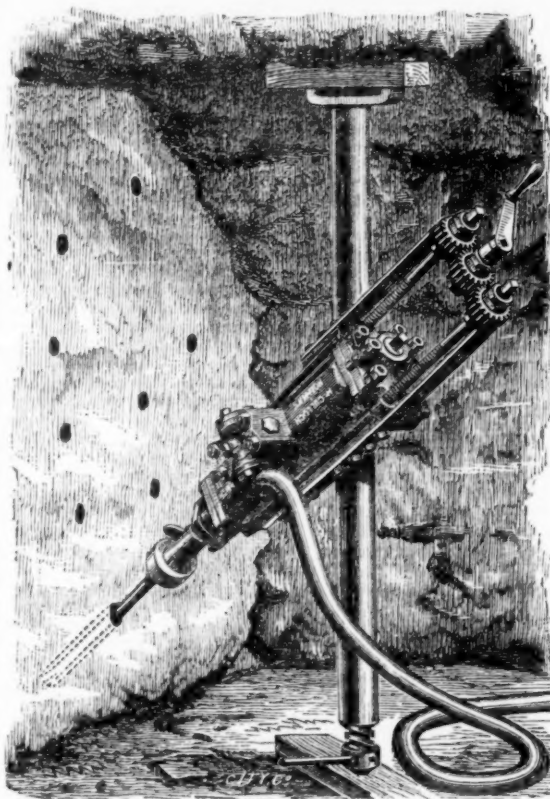
In practice they provide a furnace having a combustion chamber, a grate, and an ash-pit. A perforated pipe, of which one or more may be used, extends across or along the combustion chamber, and is fitted with a fast and loose pulley, and provided with journals in the walls of the furnace on each side. The pipe is connected with a fixed pipe by a ground joint, or an ordinary stuffing box may be used, as preferred. The said perforated pipe when used with steam and petroleum is provided with semi-spherical perforated projections on the inside over the holes, thus acting in the nature of a retort. The said fixed pipe, which connects with the boiler, may be fitted with other pipes of any desired number for the introduction of steam, air, and hydrocarbons, each pipe being provided with suitable cocks for the admission and regulation of the several jets. They prefer to use superheated steam in the distribution of steam alone above the ordinary fire grate in this construction. When petroleum or other hydrocarbons are introduced through a pipe, which is provided for the purpose, any subsidiary fire becomes unnecessary, the apparatus then constituting a hydrocarbon furnace, in which the evil effects of the blowpipe system are obviated by the even delivery throughout the furnace of gases by means of the jets issuing from the rotating pipe. As the perforated pipe becomes heated it acquires the condition of a retort, and it may then be ad-

visible to mix with the superheated steam ordinary steam or air, or saturated steam, to protect the pipe from injury.

In another form of the apparatus steam is passed through a fixed pipe, which extends some distance within the perforated pipe, and delivered into the latter, the end of which is open, so causing air to be drawn into the perforated rotating pipe, and delivered through the furnace by means of the jets from the said pipe, thus producing a thorough mixture of steam and air with the products of combustion arising from the furnace. The proportions of steam and air mixed with the said products are regulated by a valve. In some cases they connect to the pipe which enters the furnace a nozzle, which consists of a tube having a main cylindrical portion, and a tapering delivery end, and is connected at its rear end to a steam pipe. A pipe for the introduction of hydrocarbons enters and is surrounded by the said steam pipe. The steam in passing through this pipe draws with it the hydrocarbons. Its delivering end is connected with the rotating pipe that passes through the combustion chamber. Two pipes are connected to the rear end of the nozzle for the introduction of air or other fluids as required, which fluids are also drawn in by the steam in the steam pipe, the several fluids being mixed in the nozzle, from which they are forced through the spiral grooves in the front end of the nozzle into the rotating pipe end to the combustion chamber. The front end of the nozzle is fitted with a plug of frusto-conical form, and having a conical end projecting into the nozzle. The frusto-conical end is provided with spiral grooves on its surface. The steam and other fluids in passing through the nozzle are divided by the conical end of the plug, and passing through the spiral grooves receive a whirling motion, the tapering end causing them to focalise at a short distance from the end of the nozzle.

In a modification the nozzle is without a plug, but the inner sides of the tapering end are grooved spirally, so that the mixed fluids in passing out are caused to receive a whirling motion, and also focalise at a short distance from the end of the nozzle. A plug may be made without grooves, and be inserted in the grooved end of the nozzle if desirable. These focalised whirling streams of mixed hydrocarbons and steam present the requisite conditions to produce complete combustion and generate intense heat, and the steam may or may not be superheated, and may or may not be mixed with air, according to the nature of the hydrocarbons employed and the degree of heat required.

PATENT CORNISH ROCK-DRILL.



Within the last month a very gratifying testimonial as to the working of the Cornish rock-drills at Tincroft Mine has been received by Messrs. McCulloch and Holman Brothers from Mr. Wm. Teague, jun., M.E., in which it is stated that the drill is giving entire satisfaction, and that they drove with a single machine over 7 fms. in the hardest rock in four weeks, which has exceeded the duty of any of any other machine they have used; he adds, moreover, that it is very economical for air. It will be recollected that at the competitive trials in connection with the Mining Institute of Cornwall the speed of working was 20½ per cent. greater with the Cornish than with the Eclipse drill, and 76 per cent. greater than with the Barrow drill, the figures given by Mr. James Hosking, the engineer entrusted by the president and council to superintend the contest, being:—

Diameter of cylinder.	Depth bored.	Time boring.	Cub. in. ground out per min.	Mean pressure per sq. inch.
"Cornish" ... 3½ in.	13½ in.	2 min. 10 sec.	164	61 lbs.
"Eclipse" ... 3½ in.	11½ in.	2 min. 35 sec.	136	60 lbs.
"Barrow" ... 4 in.	8½ in.	2 min. 15 sec.	93	60 lbs.

With regard to the construction of the machine, it may be stated that the invention is described as relating to an improved machine for drilling or perforating rocks or other hard substances, and comprises several improvements hereinafter described, which have for their object to provide a machine which will be simple in its construction and operation, compact and durable, and not liable to become disabled through the working parts getting out of order. In carrying the said invention into practice the inventors provide three cylinders, all cast in one piece, and in such a manner that they are parallel with each other—that is to say, there is a central or main cylinder between two side cylinders, the latter being of considerably smaller diameter than the former. The two side cylinders are designed to receive the screws and nuts employed for feeding forward the machine, and the outer surfaces of the two cylinders serve as guides for the cradle. By means of this arrangement they are enabled to provide a casting which is comparatively light and strong, and all the parts thereof may be made of proportionate thickness, thus protecting the working cylinder from breakage; moreover this arrangement provides means whereby the cylinder and other parts may be readily balanced in the cradle, and the strain upon the feed nuts, feed screws, and guides will be equalised, thus preventing undue wear.

The machine may be operated by steam, air, or other suitable fluid under pressure, and for this purpose they provide in the main or central cylinder two inlet ports, and there is an aperture between the two ports which serves as an exhaust port, also to receive a tappet of triangular form which is pivoted to oscillate in this aperture to operate the slide valve. This aperture extends entirely through the wall of the cylinder, and affords communication with the interior thereof, so that all back pressure upon the pistons is prevented, as any steam or other fluid which may pass the pistons will immediately escape through this aperture and be conducted to the outer atmosphere. A steam chest is fitted upon the central cylinder, and in this chest there is a flat slide-valve having a small

projection at each end, which projections move in and out of corresponding recesses in the walls of the steam-chest as the machine works, each recess being provided with a small steel washer and an india rubber buffer, so as to take off all jar of the slide-valve. One end of the aforesaid tappet enters a recess in the underside of the valve, and the valve is thus operated as the tappet oscillates on its pivot. Within the main or central cylinder there is a piston rod, to the outer end of which the tool is secured. Within the cylinder this rod has three pistons, thus equalising the wear throughout the cylinder. The pistons have rounded edges and are forged in one piece with the rod. The central piston operates the tappet, which moves the slide-valve. The pistons and rod are rotated by means of a twisted bar, which works through the rear piston and into the piston rod and through the upper or rear cylinder cover, upon the outside of which there is a ratchet wheel and pawls. The pistons and rod may be rotated by hand or automatically by putting the pawls out of or in gear with the wheel. When the rotation is to be effected by hand the pawls are thrown out of gear, and a crank handle is placed on the outer end of the twisted bar, and thus the rod and piston may be rotated as desired. The cradle and guides which fit upon outside of the small cylinder are made in separate pieces, so that any wear of these parts may be taken up or compensated for. The two screws for effecting the feeding forward of the machine are made with left-handed threads and work into the side cylinders through nuts at the rear end thereof. The unthreaded portion of the screw rods at the rear end thereof passes through a bridge piece or extension of the cradle, and the outer end of each screw rod is furnished with a toothed wheel, each of which wheel gears with a central wheel whose spindle is secured to the rear of the extension; a cranked handle is attached to the spindle of this central wheel, or to the end of the screw rods, and by rotating this handle the machine is caused to be fed forward. The ends or covers of the central cylinders are secured to the latter by bolts which pass from end to end of the cylinder. The upper cover serves to keep the feed nuts in their place. The outer end of the piston is fitted with McCulloch's patent tool holder.

SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE INSTITUTE OF MINING ENGINEERS.

The usual monthly meeting of the members was held on Monday, at the Mining Museum, Dudley.—Mr. W. FARNWORTH, President, in the chair. The minutes of the annual meeting and of council meetings were read and confirmed. A list of subjects for papers having been prepared by the Council was discussed, and at length it was unanimously resolved that it be printed and circulated to the members, for additions and promises to read papers. Mr. W. Blakemore, jun., Wolverhampton, was unanimously elected a member of the Institute. Mr. W. E. BENTON, F.G.S., of Walsall, then read a very interesting and instructive paper upon "The Aid Given by the Microscope to Geology," practically illustrated. He said geology is perhaps the youngest member in the family of the sciences, because it had to wait for the development of chemistry, quick travelling by land and sea, and a maturer knowledge of general physics. Of all the five gateways to knowledge the optical is the one easiest of access; and the microscope has made that gateway wider, and more things have been made visible by its aid than human intelligence even ventured to dream of. He regarded the rocks as the chapters of the earth's history; the minerals composing the rocks the sentences, and the chemical elements composing the mineral as the alphabet; and the microscope as a means of spreading its smallest types, and we might look upon the sedimentary rocks as the New Testament of the geological Bible. He chose four of these rocks: 1st. The sandstone, a rock formed by mechanical agency. From an examination of this by the microscope we are convinced these rocks owe their origin to the decomposed crystalline rocks, and have after denudation—being borne to a distance by tidal action—been re-cemented together to form the sandstone of our time. Land sandstones have similar appearances, but the microscope has shown wide limits of variation. One sandstone will show an aggregation of rounded grains of quartz about from 1-50th to 1-200th part of an inch in diameter, with their edges rounded off and cemented together by quartzose cement, in which crystals of quartz have developed on the rounded granules. Another sandstone will be composed of rounded quartz grains and felspar, cemented by silica. Some will show enclosures of fragments of volcanic rocks, such as greenstone, others will be stained by hydrated oxide of iron, or contain hair-like crystals of such minerals as rutile, schorle, hornblende, chlorite, &c. (Shown.)

Mr. Benton then, secondly, took chalk, a sedimentary rock formed by animal agency, as an example of the aid given by the microscope. This has been shown to be masses of dead carcasses and shells of the family of crustacea known as Protozoa, and chiefly the genera Foraminifera, Rotal, and Globigerina; in thin slices under the microscope we observe the position they occupied at the time of consolidation of their bodies in filtration of carbon of lime. In some cases the shell fragments have a very irregular outline, and are full of minute borings, as though they had slowly decayed in quiet water. Concluding his remarks on this point, he said that the microscope has shown the chalk beds to be practically the consolidated beds of the muds which the Challenger brought up from its deepest sea soundings. As a third type of the microscopy of the sedimentary rocks, he then took one of vegetable origin—coal. He said its vegetable origin might have been established without the aid of the microscope, but the precise genera and species of plants which have contributed the vegetable matter, and the structure and affinities of the more important coal plants, have been revealed mainly by the microscope. The plants which have contributed most to these rocks are Sigillaria and Calamites, especially the former, and a prevalence of many other varieties to a smaller extent. By the arrangement of the spores about the spore cases is a strong argument in favour of the coal having been developed *in situ*. The microscope affords a good insight as to the climate of the period of the coal formation in the carboniferous epoch. It seems that in the temperate zone the climate was of such a character that the true conifers show rings of growth, not larger nor much less distinct than those of many of their modern congeners. We notice in microscopic sections of sigillarias or calamites very dense woody axes, a thick and nearly imperishable outer bark, and a scanty rigid foliage, and conclude that neither the decay nor the growth was rapid. In counting up the number of seasons occupied in the growth of an acalamite by the number of rings it shows in a transverse section, it is indicated, after much close observation and calculation, that every foot in thickness of bituminous coal implies the quiet growth of fifty generations of sigillaria, and, as a general result of the microscopic evidence, it seems that during the carboniferous coal formation there was an undisturbed condition of forest growth enduring through many generations. The reader then passed on to the fourth instance of the value of microscopic study of the sedimentary rocks—the clays—which, when submitted to great pressure and heat, are classed as slates, and become interesting as the point at which the sedimentary rocks verge into the true igneous rocks. The important question with clay slates is to account for the cleavage planes running at a different angle to the bedding plane. He showed that in very thin sections of the slates, by microscope, its crystals have been forced to arrange themselves, with their longer axes in parallel planes, and from this observation arose the theory that pressure acting along the line of the plane of bedding had forced the crystals to arrange themselves to their longer axes in parallel planes and at right angles to the line of pressure, and that in these planes the maximum of cohesion exists, and thus they are the planes of cleavage. He also drew the attention of the members to volcanic rocks. After an account of their existence, he said, lavas through the microscope vary greatly among themselves, and showed by diagrams that in we see a lava having a glossy base, and diffused through it are nebulous patches, which in places are resolved into definite particles and called "crystallites;" in another we see these crystallites arranged in a glossy base, presenting an appearance of fronds of ferns; in other cases the crystallites have united in radial groups about fixed centres, and have built up the globular masses called spherulites.

He also showed that these crystals are frequently seen to contain great numbers of excessively minute cavities, resembling a spirit level; and, after describing these in their different aspects, he said the conclusions drawn from microscopic examination with regard to the mode of origin of rocks which contain these cavities is summarised thus—1. That the crystals must have been formed in a solution of some salt.—2. That when the crystals contain only gas or vapour cavities the crystals must have been formed by sublimation.—3. That stone of glass cavities indicate that the crystals were formed by igneous fusion.—4. That the presence of fluid and gas cavities indicate the alternate presence of a liquid and gas during the formation of the crystal.—5. That crystals which contain fluid, gas, and stone cavities indicate the action of igneous fusion and of OH_2 under great pressure.—6, and lastly. That when crystals contain all the different kinds of cavities—gas, fluid, stone, and glass—then such crystals must have been formed by the united action of igneous forces, and fusion, and water, alternately with the action of gas and vapours.

After explaining the remarkable phenomenon in these cavities, the reader then passed on to the extra terrestrial rocks or meteorites, in the study of which we have had a more satisfactory introduction through the microscope than we could ever have without it, from a close study of volcanic minerals, and the minerals constituting meteorites, both seem to point to the conclusion that the earth's interior is composed of similar materials to those which we find in the small planets, called meteorites.

In concluding, he stated the summarised result of the use of the microscope in geological study has been to dispel the great physical bogey whom, in the infancy of our knowledge of geology, we believed to exercise his violent and erratic power on the earth in prehistoric times, and we cherish instead a firm faith in the belief that even from the beginning of time the influence of the physical forces operating on matter have been not more violent than such as we see in operation in our own times, and that they are, in fact, the same yesterday, to-day, and for ever.

A hearty vote of thanks was accorded Mr. Benton for his valuable paper and microscopic views, to which he responded.

The Patent Chimneyless Lamp Company, Birmingham, exhibited specimens of their colliery lamps, which were generally approved.

A vote of thanks was passed to the exhibitors.

ELECTRICAL EXHIBITION AT THE CRYSTAL PALACE.

The whole of the exhibitors having now got their lamps and apparatus in full working order, the Electrical Exhibition at the Crystal Palace can now be seen to perfection, and the relative merits of the several systems can readily be judged of. The illuminated Alhambra Court will alone repay the visitor for his journey to Sydenham, and the various arcs and incandescent lamps in use throughout the building cannot fail to satisfy him that electric lighting is applicable to domestic as well as to large scale illumination, and that the electric illumination of mines is more likely to become general than many so-called practical men suppose. In this connection it should be mentioned that an interesting and exhaustive paper was read before the American Institute of Mining Engineers at the recent meeting at Washington by Mr. N. S. Keith, of New York, upon Electrical Apparatus and Processes for the Mining and Metallurgical Engineer, and an inspection of the electric apparatus, unconnected with illumination, now on view at the Crystal Palace will render the justification of his remarks still more evident. Mr. Keith very truly remarked that too many of the comparatively old applications of electricity have been neglected by the mining engineer, which, if he had given them a place among his appliances, would have assisted him greatly. The telegraph may be noticed as one; its use is, however, confined to a person having skill in the manipulations of the key, the reading of the alphabet, and familiarity with the sounder. One of the simpler forms—the call bell—without necessity of special education, has a range of application far greater as to distance and convenience than the old wire pull, or the hoarse voice of the windlass man or the bucket dumper. A few Laclanche cells, two or more electric bells, and a mile or more of wire, judiciously placed, will put the superintendent at his office in communication with the foremen of his mills and mines, so that by the aid of a code of signals, great advantages may be gained without necessitating knowledge of the use of the electric telegraph. The recent telephone furnishes a means of communication between the often widely separated places of duty, which will save many a step, much loss of time, and wear of horse and body. It can be used by anyone who can speak. These are appliances in the art of electricity which enable the engineer to accomplish more in an easy manner than he otherwise could.

Turning to the newer appliances of electricity, it is very reasonably urged that the miner and metallurgist will find them before long so essential to his profession that their theory and practice will be taught at the school the same as metallurgy, mineralogy, and chemistry now are. That which we may call this new electricity is due to the practical development of the theory of the conservation of energy, and the consequent production of mechanism for the generation of currents of electricity of any desired quantity and intensity. So new is this electricity, in fact, that even the recent graduate of the mining schools knows little or nothing of its modes of production or its applications actually in practical operation or projected. First among the new applications which are consequent upon the extensive production of machinery for the generation of electricity comes that which appeals so sensibly to the eye—light. It has been fully determined that there is no light, except daylight, as cheap as that produced by the voltaic arc; none so pure in colour, none so bright. Many are in use in our rolling mills, machine shops, hydraulic mines, surface works, and other places. The miner needs the electric light in his shaft house, his stamp mill and his furnace. If he has no engine at the shaft house, the one at his stamp mill or furnace can be used to run an electric generator, which will send electricity through the wire conductors, so that not only his shaft houses can be illuminated, but also his mill or furnace, and even the road between, much cheaper than he can produce one-tenth of the light by the use of other means. It is doubtful, however, if the voltaic arc light will be of any great practical utility in narrow veins of mines, because the light produced is too great in quantity—and therefore too costly—more than is needed by far in the narrow space; nor in headings or stopes, as it requires in such places too frequent moving.

That men can do more and better work in a good light is beyond question, and where the night work is carried on in large spaces the electric light has no equal for economy. Where the miner and metallurgist has at his main-engine or water-wheel a suitable generator of electricity the advantages are obvious. He may be sinking a shaft at top of a mountain, where it would be impracticable to place or operate a steam-engine. But if he places there an electric motor, and connects it with his generator by conducting wires, he will have power at his command at the shaft which, by the mere turning of a switch handle, will work his whim or windlass, and hoist his ore or rock, or work his pump. The Compagnie de la Ferrière, in the valley of the Loire, are already regularly using electricity for the transmission of power. One Gramme machine is employed as a generator of electricity, and another as a motor attached to a drum, which stands at the head of an inclined plane 110 metres long, with a grade of 4 centimetres per metre. The generator is 1200 metres from the motor. The load raised is about 800 kilogrammes (1760 lbs.), and the ascent is made in 1½ minute. The work goes on with great regularity. The starting and stopping can be done as gently as desired. By means of a galvanometer in the circuit one can tell at any moment what is being done at the incline, whether the work is being stopped, whether the wagons are coming up filled or not. The work is about 2-horse power. By means of this current he can ignite his blasts. He can work his electric drills, which are said to be economical in comparison with the steam-drills. He can stop and start the drill at will, and have all the advantages of mechanical movements without the constant personal attendance of an engineer at the shaft. He can light all his works from a central station at the mill, or other place where he has available power. He can have wires branches to his laboratory, where the electric current will aid him

in his analyses and tests. There he can melt his gold, silver, and samples. He can heat, boil, cupel, roast, and perform all the operations of the laboratory which require heat, power, or the determination of chemical affinity. Think of melting metals by the fall of water! The suggestion of it even not so many years ago would have secured our excommunication. The iron and steel manufacturer can find the imperceptible flaws in his bars, and determine the amount of carbon in his steel by this agent.

An electrical method of refining copper so as to separate the gold, silver, and other metals contained has been in practical use on a large scale in South Wales for a considerable time. Plates of black copper are made the anode in an electrolytic bath, consisting of a solution of sulphate of copper. Other thin plates of pure copper are made the cathode in the bath. By the electrolytic action of the current, produced by an electric generator, copper alone is dissolved from the black copper, and is deposited in a pure state upon the cathode. The impurities of the black copper sink to the bottom of the vat, and are removed from time to time and treated for their contents of gold and silver. The cathodes, as soon as they have reached the desired weight, are removed, and the copper thereon is melted and cast into pigs for the market. This process has been found more economical than any other for accomplishing the same result. An analogous process is that invented by Mr. Keith for the refining and desilverising of base bullion. The bullion, in plates, is placed in a solution of acetate of soda and sulphate of lead, and is so connected with the source of electricity as to be an anode, while plates of other metal are the cathode. Lead is dissolved and deposited electrolytically, and the deposit is practically pure. Mr. Keith's modification of this process consists in taking the skimmings of zinc, lead, and silver which come from the kettles in the process of desilverisation by means of zinc, and putting them in bags as an anode, dissolving both the lead and zinc electrolytically, and depositing them together as an alloy, or mixture, upon the cathode plates. The contents of gold, silver, &c., are retained in the bags, and are smelted for their aggregation. The combination of pure lead and zinc is removed from the cathode and added to the next or some other succeeding lot of base bullion put into the kettles for desilverisation, and in that manner the process continues. In place of treating the whole mass of bullion by electrolysis, he gets in the first place, by the silver desilverisation, say 80 per cent. of the base bullion as market lead, and, say 22 per cent. of a rich lead and zinc which goes to electrolytic treatment. By adding then the pure lead and zinc to the succeeding lot of bullion he effects the desilverisation, and removes from it as marketable lead an amount approximately the quantity of lead which is in the bullion placed in the kettle.

But the subject which undoubtedly attracts most attention from the public is that of the "storage of electricity," which, however, it should be understood is merely a convenient term, which avoids giving, as it were, a chapter in physics, and may be readily understood as such. The first storage of electricity, other than in its so-called static condition, was effected by Planté in his well-known secondary battery. In his case, as in all arrangements for storage, energy is absorbed in the decomposition of water by electricity, which is again given up as a current of electricity when the proper circuit is furnished; or, better said, when the proper association of materials is made. The value of this arrangement of Planté, and the scope of application of its modifications, has not been recognised until recently. There is nothing to be gained by expending zinc and acid for the production of electricity to effect chemical decomposition, for the sake of the subsequent reverse action as electric current, for the battery can be used directly whenever such current is desired. But the recent mechanical means of generating electricity has so cheapened its production that it is now sometimes desirable to store up the electricity produced, as it were, in some portable form, so that it may be utilised in the place otherwise practically inaccessible for its direct production and use. Therefore some physicists having been directing their attention to means of storing the electrical energy, with a view to its use at other times and places when and where the use of either batteries or mechanical generators of electricity would be impracticable or too costly. The line of development which has received the greatest attention is the one of which Planté's secondary battery is the type. Faure's arrangement is the most prominent. The capacity of both depends upon the porosity of the surfaces of two lead plates, one in connection with the positive and the other with the negative pole of a source of electricity. Planté's cell acquired its limited capacity by result of repeated oxidations and reductions, effected electrolytically, of the surfaces of the lead while in a bath of acidulated water. Faure increased this capacity by applying a coating of oxide of lead directly to the lead plates, so that the increase on a given surface, in comparison with Planté's, is in the proportion of 2000 to 75.

The operation of charging and discharging these cells is as follows:—A source of electricity, having an electro-motive force somewhat in excess of two volts, is connected, as before stated, with the two lead plates in a bath of water acidulated by sulphuric acid, and the current is allowed to flow in them for a time limited by the current and capacity. The result is that the coating on one plate is peroxidized, and the other has its coating of oxide reduced to metallic lead. If the source of electricity be disconnected, and the wires which are attached to the lead plates be kept separate, the charge will be only very slowly discharged. But if the wires be connected, either directly or through any conducting substance, an electric current will flow in the reverse direction to that which was passed through the arrangement from the source of electricity, until the original condition of oxide on both plates is resumed. The action of the current through the plates is first to decompose the water of the solution in which the plates are immersed; the oxygen goes to the positive plate and is absorbed in peroxidation, while the hydrogen goes to the negative plate, and acts there as a reducing agent, making metallic lead from the oxide. The reverse action takes place when the wires are connected. So it will be seen that the original electric current determined a chemical affinity, which, when circumstances allow, reasserts itself with the development of a current of electricity. These storage batteries, however, are at present only in their infancy, but to them we must look for facilitating the general application of electricity.

MACHINERY AND RAILWAY PLANT IMPORTS AT RÉUNION.

The large increase in the import trade for 1880 was due to the extensive requirements of the port and railway company in machinery, rails, bridges, &c., to the value of 17,046,107 frs. It appears that the local impediments to British trade continue and appear to be on the increase. It is seldom that a British vessel returns a second time to this colony. The complaints of the shipmasters are very frequent, and the delay they experience before being able to discharge their cargoes is such as to cause serious loss. Unless lay days are stipulated in the charter-party, the consignees will suit their own convenience as to landing the cargo, and in a dormant colony like Réunion, this means months. It is very advisable that, when accepting freight for this colony, the charter-party should be most guardedly worded. It should fix the roadstead (there are no ports in Réunion) the vessel is to discharge cargo at, otherwise the vessel may be sent to half-a-dozen dangerous open roadsteads around the island, to the imminent risk of being driven on shore during the prevalence of high winds. It should state that cargo must be taken from alongside, the custom of the place notwithstanding, and, subject to the conditions of the charter-party, receipts to be given on board for the same. It should determine the number of lay days allowed for delivery of the cargo, and demurrage charged for after the expiration of said lay days. Freight should on all occasions be paid in advance at port of loading; this system some British vessels are now wisely adopting, and thereby much trouble and annoyance is saved in Réunion. Should, however, a portion of the freight be made payable at destination, it would be advisable to specify the amount to be paid in sterling money. The British Consul mentions as an example that a large British ship arrived at Réunion from India laden with rice; on her arrival at St. Denis she was ordered by the consignees to discharge portions of her cargo at four different open roadsteads around the island. The master naturally remonstrated and urged the danger to which his vessel would be exposed

thereby; but as the charter-party was not clear as to the number of (so-called) ports the cargo had to be discharged at, he had no alternative but to proceed as directed by his consignees. On arrival at St. Benoît he found that roadstead so exposed to the high winds and only one cargo boat available to discharge his own and another vessel's cargo, that he refused to remain any longer at that place and to discharge cargo there under such dangerous conditions. He had in consequence to pay to the consignees the sum of 3000 frs. as compensation for not discharging his rice at St. Benoît; this money he paid under protest. The cargo boats are likewise most unsuitable, being generally in a half rotten state; heavy claims for compensation have had to be paid by masters of British vessels on the accidental foundering of these boats, which are very liable to be swamped in these heavy shore surfs, especially when taking in railway materials, iron bars, &c., which easily penetrate through the bottom of these lighters when they are suddenly lifted up by a high wave at the moment of receiving the heavy cargo. It is mentioned, moreover, that there is not a single British firm or agency in this colony (Lloyd's agent at St. Denis is a French subject), and very few persons are able to make themselves understood in the English language.

REPORT FROM CORNWALL.

April 6.—The Easter, like all other holidays, interfere sadly with the steady progress of commercial operations, however desirable and necessary they may be to our human machinery. We shall feel the effects of the forthcoming lull more fully next week, but operations have already been restricted in sundry directions, and save in the cases of individual mines there is comparatively little activity. Little heed is paid to the minor fluctuations of the share market, and even of the metal, optimistic views of the future, and especially of the price of tin, largely prevailing; but notwithstanding this, and the increasing desire to speculate on coming dividends, we regard the present as a time in which the wary or well-advised investor may lay out money to much advantage. There is less disposition, however, manifested to embark in new projects, unless they are exceptionally sponsored, and progressive mines, particularly the older established, are largely in favour. As a subsidiary proof, but by no means a bad one, of the thoroughly active and stable character of mining in the West at the present time, we may cite the profitable nature of the operations of the Redruth Mining Exchange Company. The profits of the past year enabled the declaration of a dividend of 15 per cent. and the carrying forward of a handsome balance. The Exchange itself is also in a very flourishing condition—the Exchange Company are the proprietors of the building—with a total income of 225£. The number of subscribers has very largely increased, and the amount of business transacted is literally enormous. It is a very satisfactory feature in the operations of the Exchange that while the business done is so great the misunderstandings are so few. Mr. D. W. Bain, the Chairman of the board, commenting upon this fact, said it was simply wonderful, and that he did not think that business to the same extent where differences were so few could be found anywhere else. Cornwall sometimes gets a bad name among outsiders, for the sake of a few black sheep. The experience of the Redruth Exchange shows Cornwall as it really is.

We have already remarked, by anticipation on the fact that the East Cornwall election, by which Mr. Acland has succeeded the present Lord Robartes, had no special interest for the mining community. If there is a contest at the next general election in West Cornwall, where it is said Mr. Davies-Gilbert is to oppose Sir John St. Aubyn and Mr. Vivian, it is possible that mining questions will crop up, and perhaps amongst them the much vexed question of the rights to mineral property. Now, while we do not think we are yet far advanced enough—though perfectly familiar with the meaning of the phrase "an earned increment"—to declare all minerals the property of the State, we do think that something might be done to put the dues question upon a sound, and, indeed, the only really sound basis consistent with present ideas, the payment of fair rent for surface occupation, of fair compensation for surface damage, and the limitation of dues to a proper percentage on profits only. That would be an enormous gain, and that is feasible. We have heard quite enough of public opinion in the county of late to know that the other idea is a long way off from being ripe as yet.

For perhaps the fiftieth time in the last ten years attention is called, and rightly called, to the anomalies attending the present methods of selling our mineral produce. What prospect is there, however, of hope from proposals which really strike out no new lines. How will copper be helped by the substitution of auctions for ticketings, while the buyers remain the same, and competition may as readily be avoided under one system as under another. What is there to be gained in the case of tin by the substitution of ticketings or auctions when there are buyers who are not disposed to be bound by the decrees of the select smelting circle at the present moment? There is no virtue in change for the sake of change. As to copper, we confess we do not clearly see our way; but as to tin, we are as firmly convinced as ever that the true remedy is for mines to do their own smelting, and sell in the metal—approaching the market direct. It is of no use to tinker with a matter of this sort.

REPORT FROM NORTH AND SOUTH STAFFORDSHIRE.

April 5.—Earl Dudley has issued his customary April announcement, by which he reduces furnace coal 1s. per ton, bringing the price to 9s., but making no alteration in slack, which, unlike large coal, is in fairly active demand. The circular in which this drop is set forth was received on Saturday last. Pigs are weaker to the extent by this reduction, without, however, any specific drop having been generally declared. Consumers of all-mine forge sorts would not, in Birmingham to-day, look at such quotations as 37s. 6d. to 37s. 10s. Yet the uncertainty overhanging the labour market at the pits kept smelters from taking such terms as consumers would accept. Derbyshire and Northampton kinds were generally a shade down upon the week; but Wellingborough were strong at 27s. 12s. 6d., and without sales. Finished iron was more plentiful than for some time past. Prices were all in favour of buyers. Marked bars were a drug at 77s. 5s., for buyers anticipate that at the Quarterly Meetings the crucial price will be made 77s. Sheets were most offered, and have sold in the past few days in one or two good lots at 20s. down upon, say, a month ago.

The reduction in coal by the Earl of Dudley, which carries with it a drop in thick coal miners' wages of 4d. per day or stint, and of 2d. per day in thin coal colliers' wages, has brought about a strike of colliers which was altogether unexpected, and which, if no settlement should be arrived at, threatens to become very serious. It has already caused much inconvenience at the collieries. It is in the Dudley and Westbromwich district that the men have come out. The strike began on Monday morning, and between 3000 and 5000 men were idle on Tuesday and Wednesday, with the result that the collieries in the localities affected were totally stopped. Mr. Breakwell, the chief miners' agent in the Dudley district, advised the strike, contending that it was unjust of the masters to drop prices so quickly after the men had withdrawn a notice for an advance in wages. On Tuesday, a deputation of delegates waited upon Mr. E. Fisher-Smith, his lordship's agent, and asked him to withdraw his circular. This gentleman declined to take any such course, but expressed his readiness to be bound by any decision which should be come to at a meeting of the coal trade in Birmingham on Thursday afternoon, at which certain of the men's representatives will be present to state their case.

The Bill which the South Staffordshire Mines Drainage Commissioners are now passing through Parliament for powers to increase the rental on coal from 6d. to 9d. per ton, and on other minerals in proportion, has not, contrary to expectation, been allowed to progress without opposition. At a meeting of the commissioners on Wednesday last it was stated that petitions against it had been presented by Lord Dudley, by the Sandwell Park Colliery Company, and by the Patent Shaft and Axletree Company, all of whom are large coal-owners. The opposition from his lordship does not differ from that which was offered by him against a similar Bill promoted by the Commission in 1872

and 1878. The Chairman had no sooner announced these petitions than a representative from the Sandwell Park Colliery Company informed the Board that a compromise had that morning been effected which would obviate the necessity of the company's action proceedings.

At Wednesbury, on Tuesday, the Stipendiary gave judgment in a test case taken by one of twenty puddlers, whose wages had been stopped because they had ceased work at the Crown Ironworks, Tipton, on the ground that the fettling supplied to them was of inferior character. He said it was a reasonable contention that puddlers were not bound to work with the most inferior fettling, and he held upon the evidence that the fettling supplied to the plaintiff in this case was not such as he was bound to work with, and that he was therefore justified in refusing. Upon this finding, he gave judgment for the plaintiff, and dismissed a cross summons for damages. The other nineteen cases were amicably settled.

The Hamstead Colliery Company's seventh annual meeting was held on Tuesday. The report, which was unanimously adopted, showed that the working operations towards the completion of the colliery had progressed satisfactorily, and the Chairman stated that the coal was of good quality. It was expected that early next year the second shaft would be completed, when large quantities of coal would be put in the market. It was agreed that a building company should be formed for the purpose of providing the men engaged by company with suitable dwellings in the immediate neighbourhood of the colliery. The retiring directors, who were re-elected, were Messrs. R. Chamberlain, E. Smailman, and D. Peacock.

At the meeting of the coalmasters' and colliers' delegates, in Birmingham, on Thursday, the delegates said that all the colliers, numbering 19,000, would strike if the reduction in wages should be enforced. Ultimately Earl Dudley's agent was requested to withdraw his circular announcing the drop of 1s. per ton.

TRADE OF THE TYNE AND WEAR.

April 5.—The steam coal trade continues in a fairly healthy state, and most of the collieries in Northumberland are fully employed. There is, indeed, considerable activity shown in getting this coal worked and shipped. The Bromhill Coal Company, which has long been famed for a certain class of steam coal, has secured a contract from the British Government for a supply of coal, and ships have been chartered to take cargoes from Amble, the shipping place. In connection with the question of Durham miners' wages, the result of the ballot of the whole of those who are members of the Miners' Association was made known on Monday, and although the actual figures were not announced the feeling of the country was decidedly opposed to a strike. There can be no doubt that the colliery owners would offer a determined resistance to the advance asked for; they may possibly be inclined to concede a slight advance, but this is not certain at present. The average value of coal has not advanced much since the last return was made by the accountants appointed under the sliding scale arrangement, and as to Spring advances, the demand for gas and house coal will be reduced. In contracts now made strike clauses are invariably inserted.

Trade generally on these rivers continues good. The cement trade is busy. Fire-bricks and fire-clay goods generally are being shipped in large quantities. Sanitary glazed pipes are in fair demand. This trade has been largely developed of late. The fire-clays underlying many of the coal seams in this district are admirably suited for the purpose of manufacturing these articles. The adjourned inquest on the Trimdon Grange Colliery Explosions case was opened on Wednesday, before Mr. Crofton Maynard, coroner. M. T. W. Snagge, barrister, Mr. Bell and Mr. Willis, Government Inspectors, were present on behalf of the Home Office. Mr. J. Edge and Mr. Stanton, solicitors, Newcastle, appeared on behalf of Mr. Walter Scott, the owner of the colliery. Messrs. Bowey and Heavyside, solicitors, appeared for the Durham Miners' Union, the executive committee of which Union have, on behalf of the relatives of the deceased, put in a claim for compensation under the Employers' Liability Act. Mr. Wood, the manager of the colliery, was present, and many other viewers and colliery agents belonging to the district.

The evidence, so far, shows that the explosion only entered two districts of the mine, the pit narrow bord and the headways way, the blast having travelled inwards in the headways way and outwards in the narrow bord district. Joseph Parker, master shifter, and several deputies were examined on this day. Parker thought that the explosion had occurred in the narrow bord district. Shots were fired in the workings to bring down the coal, but in the long-wall shots were only fired at night. The most remarkable evidence on this day is that of Joseph Horton, deputy. He said that until the Tuesday before the explosion there were four deputies for the narrow bord way, but one was taken away on that day; that he complained to Mr. Cook, the underviewer, that they had too much to do, but Mr. Cook did not agree with him. He did not remember Mr. Cook saying that "they would have to do what they could, and leave the rest undone." By Mr. Snagge: It followed, of course, that if three deputies had to do the work of four the testing for gas could not be done so completely as before.

On the second day Jas. Gargett, a hewer, was examined. He worked in the narrow bord way on the morning of the explosion. His evidence shows that shots were fired regularly by the deputies during the day, and also that the deputy examined for gas for this first shot but not for a second or third shot. Wm. Day, deputy, fired the shots, and he stated that he had tried for gas for all shots. Samuel Gear, a hewer, stated that Day (deputy) informed him that he had not been able to examine the workings properly on the morning of the explosion, as he had too much work to do. Thos. Elliott, overman, examined the workings on the morning of the explosion and found the ventilation good, and found no gas in the workings or in the edge of the goaves. He had seen gas close to the cross-cut goaf in the headways district, but he had never heard of gas in the pit narrow bord district. There was no place in either of the districts he had found it necessary to watch specially. Horton's report book was produced, and witness stated that the last report of the presence of gas in the pit was on Jan. 27. He thought it was safe to fire a shot within 3 ft. of the goaf, even if gas had been reported on the day previous and the men in the pit—that is, the full shift of day men. Geo. Cooke, certificated manager of the colliery when the explosion occurred, put in a written report giving a description of the mine, the ventilation, &c. He said that no one ever complained that there was gas in the narrow bord district nor of the ventilation. He examined the workings on the morning of the explosion. In his judgment there was a sufficient number of deputies to do the work required. In August last two men took the men all out, saying that the headways workings were full of gas, but when search was made no gas could be found. He thought that the explosion occurred on the face of the goaf, near the end of the second south pit narrow bord, as there were indications of fire there. Wm. Armstrong, colliery viewer, said that as one of the exploring party he was over the headways district. He agreed with the evidence of Mr. W. H. Wood as to the seat and origin of the explosion, and as to the flush Kitty said to have been in Maitland's place. He did not think that the deputy had too much work to do before the men went in, and he did not think it dangerous to fire shots in Hart's place. Nicholas Wilkinson, an agent of the Durham Miners' Association, was one of the exploring party. He came to the conclusion that there had been two explosions—first one in Maitland's place and then a larger one in the pit narrow bord. The first explosion originated from a flush Kitty in Maitland's place, went down the return on the edge of the goaf, and made its way into the main intake headways district, and finding its way into the pit narrow bord goaf. He could not explain how it got there, but it was his opinion that it had, and that it drove the gas from the goaf on the men's lamps, causing them to go away without the lamps, and creating the explosion which was the most disastrous of the two.

Mr. Thos. Bell, Government Inspector, could not agree with the theory of an explosion occurring in the headways, narrow bord, and crossing to the goaf of the pit narrow bord, and causing a second explosion. He agreed with Mr. Wood as to the seat of the explosion. He thought that the gas had been lodged in the top of the

goaf, and this by a fall of stone had been forced to where the men were working, and through the gauze of the lamps. Cross-examined by Mr. Bowey: He did not think that Hart's place was a proper place for powder to be used. He thought it was too near the goaf, but he did not think that a shot caused the explosion.

The Coroner briefly addressed the jury, and an hour afterwards they delivered their verdict in writing as follows:—"We have agreed that John Ramsay and others lost their lives by an explosion of gas in the pit narrow bord longwall in the Harvey seam, Trimdon Grange Colliery, on Feb. 16, but from what cause we have no evidence to show. We recommend that in future no shots be fired in the day time, or during the time men are in the pit, within 40 yards of the standing or fallen goaf. We further recommend that more deputies be employed, and we also recommend that a general report book be kept, and that the contents of each official's report book be copied into this report book daily."

This is certainly a remarkable case, the firing of shots appears to have been conducted in a very peculiar manner. The evidence appears to show that the rule was that shots were only to be fired in the longwall at night when the bulk of the men were out of the pit, yet we find that shots were fired during the day and all day. Shots were also fired within a few feet of the edge of the goaf, although gas had been observed at the edge of these goafs on numerous occasions, and according to the opinion of Mr. Bell, the Government Inspector, all the goaves in the Harvey seam would be charged with gas at the top. The recommendation of the jury that a general report book should be kept at the office, the reports in the books of the various officials to be copied into this book, leads to the inference that such a book was not kept, and to say the least this circumstance appears to be extraordinary and unusual.

The pig-iron trade has shown more animation this week, and there has been a better inquiry and higher rates. The shipments have been heavy, and will be larger for March than for some months past. France has been a large consumer and the Continent generally, Austria, Italy, &c. The shipments to Scotland have been smaller. The manufactured iron trade has also been steady; makers quote ship-plates at 77. 5s. Pig-iron is 43s. 3d. for No. 3. Messrs. Connell's stocks of warrants are now 160,722 tons. There has been a reduction on the week of 3150 tons. The Cleveland ironmasters' monthly returns, showing the make and disposal of pig-iron during March, were issued on Monday. The stocks of pig-iron on the 31st ult. were 334,850 tons, showing a decrease of 29,970 tons compared with the month of February. The shipments in March were 89,837 tons, in February 66,893 tons. In March, 1881, the shipments amounted to 81,609 tons, thereby thus an increase in March, 1881, of 8,228 tons. The arbitrators in the iron trade on Monday the hearing of the wages claim of the finished ironworkers connected with the iron trade in the North of England was fixed for Wednesday, the 12th April, at Middlesbrough. Mr. J. W. Pease is the arbitrator.

The news that the Weardale Lead Mines will be worked as usual is most welcome, these lead mines are one of the oldest and probably one of the richest mining industries in the world. It is well known that the Romans discovered lead mines in Britain, and the Weardale lead mines were without doubt worked by them, as they have left altars, coins, and other relics in the dale. Weardale was in the holy see of St. Cuthbert, and lead was largely used for the churches and large houses from the tenth century onward, and the bishopric drew large revenues from this source for centuries. In the year 1401 Roger Thornton, a Newcastle merchant, leased the mines in Weardale, near St. John's Chapel. The Blacketts were early engaged in lead mining in this district. In those early times the lead was taken from Weardale to Newcastle by means of pack horses. William Blackett, who had gained much wealth by his mines, was created a baronet in 1673, and there were several generations in the male and female line. Upon the death of Sir Thomas Blackett, in the year 1792, his only daughter, Diana, succeeded to the Weardale Lead Mines. Diana Blackett married Thomas Richard Beaumont, of the Oaks, and thus the lead mines came into the hands of the Beaumont family. This Mr. Beaumont represented the county of Northumberland in five successive Parliaments. These famous mines appear to have reached the zenith of their prosperity when Wentworth Blackett Beaumont attained his majority, which was celebrated with great pomp in April, 1850. Mr. Sopwith, the mining agent, had been chief manager of the mines there for many years, and had contributed greatly to their success by his great skill and untiring industry. This celebrated mining engineer and scientific man died only a few years ago. A dinner was given on the occasion of this celebration to all the lead miners, smelters, &c., engaged on the extensive works. In East Allendale 870 miners and smelters dined; West Allendale, 506; and in Weardale 1255; making, with 303 boys, 2934 persons who partook of the hospitality of their employer. The event was celebrated with cannon, illuminations, &c., and two lithographs framed, representing the celebration at Bywell Hall, were presented to the agents as memorials of the affair. On the marriage of the lessee of the Weardale Mines, W. W. B. Beaumont, to Lady Margaret Anne de Bury, fourth daughter of the Marchioness of Clanricarde, on March 6, 1856, great rejoicings took place in Weardale.

REPORT FROM DERBYSHIRE AND YORKSHIRE

April 6.—At the ironworks in Derbyshire a steady business has been done of late, the out-put of the furnaces being up to the usual average. The demand, however, has not quite kept pace with the production, buyers evidently holding back, and not going much beyond their present requirements. The mills have worked much as usual, and there has been some improvement as regards foundry material, especially pipes. At Ironfield the make of steel has been large, and rails as well. The migration of the works appears determined upon, and this will be a serious matter for the inhabitants. The collieries have not worked quite so well of late, short time being the rule. A fair amount of house coals, however, has been sent from several collieries to the London market, but the prices are such as to leave scarcely any profit. Derbyshire coal now sold to the metropolitan consumers as low as 19s. per ton, whilst the railway rate and truck hire will be about 8s. 2d. per ton, and the carting 3s. to 3s. 6d., and there are the usual terminal charges and merchants' prices, so that it is evident that the charge at the pits must be very low indeed. Steam coal has met with a fair sale, a good deal being taken by the railway companies in particular. For other descriptions of coal a steady demand has ruled.

In Sheffield most branches are working fairly, although in some of them there is not quite as much activity as there was a month or two since. Steel-facel plates are being largely produced by both Brown's and Cammell's for our own as well as for other Governments. Other plates for ordinary purposes also continue in fair request. Of late there has been some increase in the quantity of steel produced for various purposes, there being every evidence that steel is fast supplanting iron for structural work, whilst there is more being required for the Clyde and other ship-building yards. The cutlery houses are kept steadily going, a good deal being on American account, some orders also being in hand for the Continent. The sheep-shear branches are now in full swing, orders continuing to flow in from South America and more distant countries, and the season will evidently be a most active one for the makers. Bessemer rails are still being extensively produced, but the price at which orders for them have to be taken leaves only a small margin of profit after the railway charges to Hull or Liverpool have been paid. The companies will lose some good customers by their determination not to lower their rates to what would be a moderate and at the same time a paying amount, but about 2d. a ton per mile is by far too much, and gives makers in Sheffield no chance of competing with those at Barrow, the North of England, and South Wales, who can ship without railway intervention. Engine makers and machinists have been working better of late, and there has also been more doing at the foundries in stoves, grates, ranges, piping, and builders' castings. Outside the town the works as a rule are fairly off for business, and this is the case at Attercliffe, B. Lightdale, Chapelton, and HLECAR. At the latter the mills have been running steadily, but there is not the same activity in the district that there was at one time, and for some time past a less quantity than formerly of pig has been made

at the furnaces of Mr. G. Dawes. Messrs. Cammell and Co.'s works at Peristone are now working well, especially as regards Bessemer rails.

The coal trade of South Yorkshire is in anything but a healthy state just now, owing to the low price which has to be taken for all qualities, while at the same time the miners at some places are asking for an increase of wages. From some few collieries, including Darfield, Mitchell's, and Newton and Co.'s, a tolerably fair tonnage of coal has been sent to the Metropolis of late. Steam coal has gone off well for the time of year, and the busy season promises to be an early one so far as the shipments to the North of Europe are concerned.

REPORT FROM NORTH WALES, SALOP, AND CARDIGAN.

April 6.—The North Wales colliers have received notices of a reduction of 5 per cent. on their wages. As they were advanced 7½ per cent. some time ago this reduction will just leave them 2½ per cent. better off than they were a year ago, with the addition of more regular work. The iron trade of the district keeps good, and is in certainly a better condition than that of coal.

The prospectus of the Roman Boundary Mine is issued in the local newspapers. This mine is situated to the north of the Roman Gravel Mine. Why does not somebody go to work in good earnest on the south boundary of the same mine? A boundary which has never yet been properly proved.

Turning this week to the mines of Anglesea, the Mona Mine looks well underground, and the exploratory work underground prove the value of the mineral resources of the property. The principal works in progress at present are the sinking of Cairn's shaft, in which another channel of ore ground has been entered upon, which appears to be to the south of anything hitherto met with in this part of the mine. A driving is being carried forward south from Tiddy's shaft in the eastern part of the property. This level has just cut Charlotte's lode, which is believed by the miners to be a continuation of the North Discovery lode, formerly worked so profitably in the Parys Mine. The ground here is very promising.

At Parys and Morfa Du Mines the underground operations are carried on with activity. At the latter mine a large quantity of bluestone is ready for the market, and has, I believe, been sold within the last few days. At Mona Consols, on the seashore near Bull Bay, there are a good many men employed, but the operations have been rather hindered by the inflow of water, to cope with which a pumping engine is to be erected. Small quantities of very rich ore have been obtained, and the appearances of the mine are exceedingly encouraging. A company has also been formed to work the ground at Llancilian Mountain, to the east of Parys Mountain, but as yet not much work has been done. This is the old Rhosnannerch Mine, which formerly turned out large quantities of rich copper ore. The prices of copper and lead are of course sadly against the success of mining operations here and elsewhere, and it is difficult in even the best mines to make more than a small profit. With a slight advance in prices, which is sure to come, there is still a good future for these historic Anglesea mines.

TRADE IN SOUTH WALES.

April 5.—The steam coal trade, although the amount shipped has been up to the average, is not so active as it has been, and prices are somewhat weaker. The amount sent away from Cardiff has been 109,594 tons; Newport, 28,867; Swansea, 18,436. There has been a great find at Tylacoch, in the Rhonda Valley, as the sinkers there have struck a 6-foot seam of excellent coal, which has for a long time baffled their engineering skill, owing to a fault. These constant discoveries must have their influence in discussing the question of exhaustion, which exercises the minds of the pessimists on all occasions. The finding of this seam will have it said some influence in working another seam in the same colliery. The iron trade in South Wales has suffered a great loss in the death of Mr. Menelaus, at Tenby. He was a man of inflexible will, great resources, and much culture, who gave his undivided attention to his duties, and never allowed small ambitions to turn him away from his duties. Such devotion is rarely witnessed. When asked to fill some office which other men strove after he invariably refused, as he thought it would interfere with that great taste upon which he had set his mind—how to keep the Downla Works going in a period of depression. From the active years of 1873-4 down to the present moment the works have never been stopped. When iron rails were not in demand he turned his attention to the make of steel, and all the surplus coal from the collieries was sent to market. About a twelvemonth ago he added the make of tin-plates to that of the other industries, and thus gave more employment to the men, and enabled the proprietors to place another string to their bow. The tin-plate manufacturers of Llanelly and Swansea have resolved to combine and reduce the output by closing their works one week in four for the next three months under a penalty of 500L, if the majority will agree. This has already had a good effect upon the market. Coke-made are now 16s. 6d. per box at Liverpool, and charcoal-made from 21s. to 23s.

For some months past operations on an extensive scale have been carried on at the Tylacoch Colliery, with the view of reaching what is generally known as the "Six Feet" seam, the same as is at present worked in the Cwmrdre and Cwmpark Pits. A great fault inside the workings has for a long time baffled all engineering and mining skill to reach the seam, but on Saturday morning last the efforts were rewarded by finding this, as it has turned out to be, a most excellent seam. Through the finding of this seam another good seam can be worked with greater facilities and more advantage than at present. The occurrence has caused general rejoicings in Treorcy and neighbourhood. The Tylacoch Colliery is situated close to Treorcy station (Taft Vale Railway), and is the property of the Hafod and Tylacoch Steam Coal Company, Mr. Thomas Jones, Ynysybi, being the chief proprietor, and Mr. Thomas Thomas, Treorcy (author of the article "Coal Dust in Mines, and its Abatement," is the manager.

GENERATING AND CONVEYING ELECTRICITY.—The improvements suggested by Mr. AIME MASSON, of Bordeaux, consist in the application of dynamo-electric machines of an earth current for the purpose of regulating the path of electricity generated, combined with the application of insulated wires. Also in the use of a cable, or for the conveying of electric currents generally, of an insulating medium composed of cement mixed with powdered iron. Also in the arrangement of the dynamo-electric machinery, so that it can be revolved at the same speed as its motor, and a series of generating machines and their accessories be worked on one and the same shaft. The improvements are performed by using pairs of metal discs, one fixed on a base and opposed to another, made revolvable on a shaft, all said discs being furnished with projecting magnets made to interlace without touching one another; a series of pairs or sets of discs may be used, and so large force generated in a small space and with small power. The movable set of discs are supplied with copper projections insulated and put in connection with the earth-current. The whole is mounted on a strong support and the disc revolved by any convenient mechanism.

ZINC WHITE.—The invention of Mr. JOHN CRAWLEY, of Newark, U.S., relates to the manufacture of white zinc pigment for use as paint and for other purposes, and consists essentially in an admixture of precipitated sulphide of zinc, or precipitated sulphide of zinc and precipitated sulphate of barium or calcium, or both, with oxide of magnesium prior to ignition or calcination of the mass. When precipitated sulphide of zinc and precipitated sulphate of barium of calcium, or both, are intimately mixed with above a per cent. of oxide of magnesium, and the admixture is ignited or calcined at a red heat, the resulting pigment will not readily become discoloured on exposure to light, even to sunlight, which would be the case if the oxide of zinc were not present during the operation of ignition or calcination. When precipitated sulphide of zinc and precipitated sulphates of barium or calcium, or both, are mixed with oxide of magnesium, as above described, and then ignited at red

not only will the resulting pigment possess greater permanence of colour, but will also have superior covering power or body, as well as greater whiteness and friability than when native sulphates of barium or calcium are mixed with sulphide of zinc as diluents or diluents, as has heretofore been done.

Lectures on Practical Mining in Germany.

CLAUSTHAL MINING SCHOOL NOTES—No. CLXLIV.*

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In the lectures treating on Rock Drills, which are almost exclusively driven by compressed air, we stated that we should leave the subject of compressed air and air compressors to those lectures treating of the use of compressed air for hauling engines. The use of compressed air for hauling engines necessitates but very few alterations in the design of the latter, which will be noticed later on, so that the main questions for consideration are the theory of construction of air compressors, and advantages and disadvantages of compressed air as a transmitter of power.

THE THEORY OF AIR COMPRESSION cannot be treated in these pages fully, as to do so would require the introduction of numerous mathematical formulae and calculations; we shall, however, indicate the principles of the calculations.

According to the law of Boyle the volume of a gas varies inversely with its pressure. When air is compressed in a cylinder the pressure increases as the volume diminishes; it is found, however, that the compression causes a rise of temperature, and the above law holds good only when the temperature remains constant. The law giving the relation between the volume pressure and temperature for two cases, called Poisson's law, may be stated to be as follows:—The quotient of the volume in the second case, divided by the volume in the first case, is equal to the product of the two quotients obtained, 1st by dividing the pressure in the first case by the pressure in the second, and 2nd by dividing the absolute temperature in the second case by the absolute temperature in the first case.

In the usual arrangements the air compressor is placed at the surface, and the engine to be worked by the compressed air in the mine at a much lower level. In consequence of this great difference in level the pressure of the air when it arrives at the engine is much greater than that at which it is delivered from the compressor, unless the loss of pressure due to the loss of heat and friction in passing along the pipes should be very great. Supposing that no loss of pressure on this account took place, the excess of pressure at the hauling engine over that delivered from the compressor would be that due to a column of air of the height equal to the difference in level, and of the mean density of the air in the pipes passing down the shaft. By means of the above law of Poisson, and assuming the weight of 100 cubic inches of air at 60° Fahr., and under a barometric pressure of 30 in. at 31 grs., we can ascertain the extra pressure of the air due to the difference of the level. Owing to the fact that the cooling of the air in the air compressor is limited, it will be well to assume the mean temperature of the air in passing down the pipes in the shaft at 70° Fahr., or 20 Centigrade. From the above we obtain the following rule for finding the extra pressure due to the difference in level. The extra pressure in pounds to the square inch is equal to 0.00234 times the product of the mean pressure in pounds to the square inch in the air pipes, multiplied by the difference of level in feet. To find the pressure of the air at the hauling engine underground this extra pressure must be added to the pressure of the air delivered from the air compressor, and from the sum of these must be subtracted the loss of pressure due to the friction of the air in the pipes. The rule to find this has been already given in the lectures on ventilation.

When the piston of the air compressor moves forward it gradually compresses the air, until the latter attains the same, or a slightly greater, pressure than that in the receiver, when it opens the valves leading into the receiver, and then drives the air forward into the receiver. If we for a moment neglect the frictional resistances to be overcome we may consider the work done through the piston of air compressor as consisting 1st in compressing the air (working against a varying pressure), and 2nd in pushing the compressed air into the receiver (working against a constant pressure). The amount of work done in this latter case is obtained simply enough by multiplying the area of the air compressor piston in square inches into the pressure of the air in the receiver (measured in pounds to the square inch), and then multiplying the product thus obtained by the distance, measured in feet, travelled by the piston after the air in the cylinder has been compressed to the same density as that of the air in the receiver. In calculating the work done by the piston during the first portion of the stroke against a varying pressure we must bear in mind that by the act of compression the temperature of the air is raised, and also that owing to the use of water for the cooling of the air the temperature is reduced. If no cooling of the air took place, either by radiation from the cylinder or by a water jacket, or water injection, the curve of pressures taken by an indicator diagram would be an adiabatic curve. If, on the other hand, the cooling of the air could be made to keep the temperature of the air constant (at the temperature of the surrounding atmosphere) the curve obtained would be that which would be given by Boyle and Mariott's law. This latter curve is usually designated the isothermal curve. Since, however, the cooling cannot practically be carried to this extent the actual curve obtained will be somewhere between the two. A glance at the two curves will show that the work required to be done when the compression follows the isothermal line is much less when the compression follows the adiabatic curve. The better the design of the compressor with regard to the cooling, so much the nearer will the curve of compression follow the isothermal line. Assuming this to be the case (that the compression follows the law that the pressure varies inversely as the volume), the work done through the piston in compressing the air is obtained by multiplying the area of the piston by the full length of the stroke, by the pressure at the commencement, and lastly by the natural logarithm of the ratio of the pressure of the compressed air to that of the air at the commencement of the stroke. The measurements for pressure should be absolute, and not merely that above the atmospheric pressure. This being the case, to obtain the actual work done through the piston of the air compressor we must subtract the work due to the atmospheric pressure on the opposite side of the piston (obtained by multiplying the area of the piston in square inches by the full stroke in feet, by the pressure of the atmosphere in pounds per square inch), from the sum of the work done through the piston in compressing the air, and in driving it into the receiver. Owing to the dead space between the piston at the end of its stroke and the cylinder cover and valves, the whole of the compressed air is not forced into the receiver, but the part remaining in the cylinder expands until its pressure falls slightly below the atmospheric pressure. The actual quantity of air taken in at each stroke is, therefore, only from 80 to 90 per cent. of the volume of the cylinder, and the actual work done through the piston 80 to 90 per cent. of that given above.

We have in the first portion of this lecture described the mode of ascertaining the pressure of the air on arriving at the engine underground from the pressure of the air in the receiver and the difference in level between the air compressor and the underground engine. We have now to consider the action of the compressed air in driving the underground engine. If the engine works non-expansively the work done by it in pushing forward the piston is obtained simply by multiplying the area of the piston in square inches by the length of stroke in feet by the pressure of the air in pounds per square inch. If the pressure is given in absolute terms we must first subtract from it the pressure of the air surrounding the engine. This can be measured directly, or found by adding

to the atmospheric pressure at the surface, the pressure due to a column of air equal in height to the difference in level between the air compressor and hauling engine.

To use compressed air with any advantage it should be employed expansively, and we have then to consider the work done by the compressed air before the cut off (at full pressure), and the work done after the cut off (when the air is expanding). The first is obtained simply by multiplying the area of the piston in square inches by the pressure of the air in pounds to the square foot; and, lastly, by the distance travelled by the piston in feet before the cut off. During the portion of the stroke after the cut off the air expands, and at the same time lowers in temperature. Since little heat is taken up through the cylinder from the surrounding atmosphere the curve of expansion will be an adiabatic curve, following the combined laws of Boyle and Gay Lussac. According to this the ratio of the pressure after the piston has travelled over a distance (say, d), to the initial pressure is equal to the ratio of the distance travelled before the cut off to d , raised to the 1.408th power—1.408 being the ratio of specific heat at a constant pressure to specific heat at a constant volume. From this we obtain the following rule for the work done by the compressed air after the cut off:—The work done by the compressed air whilst expanding is equal to the product of the area of the piston in square inches, into the initial pressure in pounds per square inch, into the length of the full stroke in feet, into a factor dependent on the ratio of the full stroke to the distance travelled by the piston before the cut off. If we call this ratio r , the above factor is 2.41 into 1 , minus, the reciprocal of r raised to the 0.41 power. In the above calculations the pressures per square inch are absolute, and to find the work actually done through the piston, from the sum of the work obtained as above done before and after the cut off, we must subtract the resistance of the atmosphere on the opposite side of the piston acting during the whole of the stroke.

A comparison of the adiabatic and isothermal curves will show how great is the importance of cooling the air during its compression in the cylinder, and consequently a water injection is usually preferred to a water jacket for the above purpose. For this reason also a slow piston speed is advantageous. With a water injection the water in the cylinder materially assists in causing the piston to work air tight. Theoretically, the most advantageous arrangement would be to cool the air before entering the compressor to such an extent that the (increased) temperature at the end of the stroke would just be equal to the temperature of the surrounding air. The work of compression would in this case be a minimum, and no loss of power would take place owing to loss of heat in passing along the pipes. The pressure is usually carried to three or four atmospheres, and the ratio of expansion is seldom greater than twice, otherwise the temperature falls so low that ice is formed in the exhaust ports and pipes of the underground engine.

THE TIN TRADE.

Messrs. EBELING and HAVELAAR (Rotterdam, March 31): With the exception of a few days' activity we have had a very dull market for tin throughout this month. Prices at one time reached 63½ d. for 14 days' prompt, but have since been slowly receding, and now show a decline of 1½ d. compared with the closing rates of February. The Dutch Trading Company's second sale in 1882 took place yesterday, when 21,723 slabs Banca were sold from 63½ d. to 63½ d. at average 63½ d., and 1943 slabs Billiton were sold from 63½ d. to 63½ d. at average 63½ d. Next sale will be held towards the end of May. Banca has been in limited request. From 67 d. there was a sudden rise to 63½ d. and 63½ d., which prices, however, brought out a good many sellers. The feeling has since been dull and inanimate, prices gradually giving way to 63½ d. Since the sale there are sellers at 63½ d.—Billiton: Parcels on the spot have again been very sparingly offered. Forward deliveries at one time in great demand, 59 d. being paid for May and June delivery, but since declining to 67 and 68½ d. Fourteen days' prompt is now offering at 63½ d. On Tuesday, April 25, a public sale, comprising from 12,000 to 13,000 pounds Billiton, will take place at Batavia. The position of Banca tin in Holland on March 23, according to the Official Returns of the Dutch Trading Company, was—

	1881.	1882.	1883.
Import in March	9,345	19,726	4,667
Total three months	41,724	39,690	21,128
Deliveries in March	8,991	14,387	9,205
Total three months	23,391	35,465	33,619
Stock second hand	88,775	45,445	50,063
Unsold Stock	56,722	51,779	28,405
Total stock	107,498	93,224	78,473
Afloat	17,000	8,200	4,750
Statement of Billiton:—			
Import in March	9,282	16,250	5,100
Total three months	23,430	26,750	16,444
Deliveries in March	9,438	11,995	5,241
Total three months	24,353	24,947	19,537
Stock	20,021	22,160	19,537
Afloat	15,000	14,000	7,000
Quotation, March 31—Banca	63½ d.	63½ d.	63½ d.
Billiton	63½ d.	63½ d.	63½ d.

These combined returns of Banca and Billiton for 1882, compared with those for 1881, exhibit—A decrease of the import for March of 527 tons; an increase of the import for the three months of 24 tons; a decrease of the deliveries for March of 24 tons; a decrease of the deliveries for the three months of 421 tons; a decrease of the stock second hand of 617 tons; an increase of the unsold stock of 217 tons; a decrease of the total stock of 430 tons; an advance of the quotation of Banca of 22½ pence, per ton.

Messrs. STRAUSS and Co. (London, March 31) issue the following

	Mar. 31,	Mar. 31,	Mar. 31,
	1881.	1882.	1883.
Straits and Australian, spot	1,854	8,654	1,089
" " " " " "	7,540	8,654	8,092
Straits, afloat	965	470	—
Australian afloat	1,845	1,499	1,456
Banca, on warrants	1,524	1,451	1,565
Billiton, spot	940	1,630	1,692
" " " " " "	729	850	1,010
Australian tin in Holland	12	—	200
Stocks in America, including quantity afloat	2,780	3,294	6,000
Total	16,375	18,074	22,174
Prices of Straits and Australian	£107 5	£93 5	£98
Deliveries during month in London	1,085	1,109	980
" " " " " "	594	810	401
Total	1,679	1,919	1,381
Shipments during month from Straits to London 525 tons, from Australia to London 197 tons, from Straits to America 725 tons, from Australia to America 411 tons.			
During twelve months.	1882.	1881.	
Shipments from Straits to London	5,269	4,830	
Shipments from Australia to London	8,953	8,690	
Shipments from Straits to America	7,220	6,485	
Shipments from Australia to America	1,254	725	
Deliveries of tin in London	15,299	13,416	
Deliveries of tin in London and Holland	23,248	21,196	
Banca in Trading Company's hands and afloat, 2899 tons.			

THE COPPER TRADE.

Messrs. HENRY R. MERRON and Co. (Leadenhall-street), March 31:

Issue the following Statistics of Copper:—	
Stocks in Europe:—	
Chili bars, Liverpool and Swansea	Tons 21,553
Chili ingots, Liverpool and Swansea	1,087
Chili ores and regulus, Liverpool and Swansea (fine)	1,653
Other furnace stuff, Liverpool and Swansea (fine)	4,533
London, Foreign copper (chiefly Australian) and Landing	8,635
Chili bars, ingots and barilla in Havre	2,319
Other copper in Havre	460
Afloat, and chartered from Chili to Europe (advised by mail):	
Ore and regulus (fine)	2,582
Bars and ingots	5,631
By cable, ores and regulus (fine)	500
Bars and ingots	1,900
Afloat from Australia to Europe (advised by mail):	
Fine copper	397
By cable: Fine copper	1,000
Total	53,030
Price of Chili bars, 64½, 5s. per ton.	

Messrs. HARRINGTON, HOBAN, and Co. (Liverpool, March 31):—Chili copper charters for the second part of this month are not yet to hand, but are daily expected. During the past fortnight the Chili bar market has been rather inactive, and only a limited business has been done at from 65½ down to 64½, according to prompt and brand. Market to-day is steady at 64½, for good ordinary brands on the spot. The sales of furnace material comprise 262 tons Peruvian ore at 12s. 3d., 440 tons Bolivian ore and 271 tons Bolivian regulus ex Toopilla at 12s. 3d. and 12s. 6d., respectively. 761 tons Bolivian regulus ex Maxima at 12s. 6d., 514 tons Cape ores at 12s. 4d., 1540 tons New Quebrada ore at 12s. 3d., 78 tons Italian ore at 12s., and 28 tons at 12s. 1½d. (both low produce), 105 tons Newfoundland ore at 12s., 460 tons Spanish precipitate at Swansea (68 to 70 per cent.), and 55 tons English precipitate (buyer's work) at 12s. 6d. per unit, and 1800 tons Coro Coro barilla are reported as sold for France for delivery over a period. There has been no Swansea sale by tender during the past fortnight. Import of Chili copper during the past fortnight, 207 tons 84s.

against 773 tons fine same time last year; delivery of ditto, 1845 tons, against 825; import of other copper during the past fortnight, 857 tons, against 545; delivery of ditto, 1994 tons, against 1033. Arrivals here during the fortnight of West Coast S.A. produce—Iberia, from Valparaiso, with 60 tons bars. At Swansea—Beta, from Toopilla, with 733 tons ores. Stocks of copper (Chilian and Bolivian) in first and second hands, likely to be available, we estimate at—

	Ores.	Regulus.	Bars.	Ingots.	Barilla.
Liverpool	—	—	12,369	1087	—
Swansea	738	3,346	9,134	—	—

Total 738 3,346 21,553 1087 —
Representing about 24,293 tons fine copper, against 25,932 tons 15th ult., 32,391 tons March 31, 1881; 33,000 tons March 31, 1880; 28,145 tons March 31, 1879. Stock of copper contained in other foreign ore and Spanish precipitate, 4539 tons fine, against 1516 tons March 31, 1881. Stock of Chili bars and ingots in Havre, 2235 tons fine, against 3381 tons March 31, 1881. Stock of Coro Coro barilla in Havre, 45 tons fine, against 53 tons March 31, 1881. Stock of copper other than Chili in Havre, 460 tons fine, against 270 tons March 31, 1881. Stock of Chili copper afloat and chartered for to date, 10,200 tons fine, against 11,900 tons March 31, 1881. Stock of foreign copper in London, chiefly Australian, 8700 tons fine, against 8900 tons March 31, 1881.

Messrs. JAMES LEWIS and SON (April 1) write:—The stocks of Chili produce are—At Liverpool: Bars, 12,369 tons; ingots, 1087 tons; and at Swansea: Bars, 9134 tons; regulus, 3346 tons; ore, 738 tons. These figures represent about 24,293 tons fine, against 24,521 tons on March 1, and against 23,391 tons fine on April 1, 1881, when the quotations were—Bars, 61½, 5s.; ore, 12s. 6d. The stocks other than Chili produce are—At Liverpool and Swansea, 4539 tons fine; London, 8510 tons; Havre (Chili, A.S.), 2717 tons=15,350 tons, against 15,353 tons March 1, and 14,084 tons on April 1, 1881. The total visible supply is 51,843 tons (to which must be added the Chili charters to March 31), against 54,190 tons on March 1, and 53,890 tons on April 1, 1881.

Messrs. RICHARDSON and Co. (April 1) write:—The stocks of foreign copper produce remaining here unsold this day are—Ore, Chilian, 733 tons; regulus, 3346 tons; ore Cape, 1541 tons; New Quebrada, 3346 tons; Newfoundland, 105 tons; regulus, Rio Tinto, 137 tons; ore, Libiola, 635 tons; Caviara, 323 tons; regulus, French, 25 tons; ore, Dutch, 20 tons; British, 139 tons; regulus 541 tons—tot. ore, 8519 tons; regulus, 3562 tons. Copper, Chilian, 9134 tons; Freeport, Rio Tinto, 357 tons equivalent to about 12,215 tons of fine copper. We have had no pvt. ticketing since Jan. 17. The private sales last month comprised 1650 tons New Quebrada ore, at 12s. 3d.; 650 tons Newfoundland ore, at 12s.; 550 tons Cape ore, at 12s. 4d.; 410 tons Cueva de la Mora precipitate, and 38 tons Aljustrel, at 12s. 6d.; 439 tons Bolivian ore, and 1020 tons regulus, at 12s. 3d. and 12s. 6d. Early in the month the copper market took an upward tendency, Chile bars being in good demand at 64½ to 65½, cash, and 63½, three months; slight fluctuations have occurred since, but good business has been done. During the last few days values have been somewhat easier, caused probably by the large arrivals of copper produce, which have sensibly increased our metal stock—at the beginning of the month the stock of fine copper was over 8000 tons less than the corresponding period last year. Chili charters for the first half of March are rather heavy, being 950 tons pure bars and ingots, and 30 tons in ore and regulus for England, and 600 tons bar for France, but taking the first two months of the year, the charters show a decrease as compared with the past three years, being, for January and February: in 1879, 7915 tons; in 1880, 10,709 tons; in 1881, 5279 tons; and in 1882, 5257 tons.

THE COAL TRADE.

Mr. J. R. Scott, the Registrar of the London Coal Market, has published the following statistics of imports and exports of coals into and from the port and district of London, by sea, railway, and canal, during March, 1882:—

IMPORTS.		EXPORTS.	
By Sea.	Ships. Tons.	By Railway and Canal.	Tons. cwt.
Newcastle	177 169,297	London & North-Western	114,660 11
Sunderland	112 85,907	Great Northern	72,535 0
Seaham	41 20,276	Great Western	81,936 0
Hartlepool	60 24,649	Midland	184,940 0
Mid-derborough	2 813	Great Eastern	53,882 2
Scotch	12 6,128	South-Western	5,651 17
Wales	28 22,405	London, Chas., & Dover	5 0
Yorkshire	32 4,481	South-Eastern	1,924 0
Small coal & cinders	6 4,271	Grand Junction Canal	665 10
Colonial	6 293		
Total	476 338,483	Total	424,207 0
Imports—Mar., 1881	481 380,627	Imports—March, 1881	533,385 11

Comparative Statement, 1881 and 1882.

By Sea.	Ships. Tons.	By Railway and Canal.	Tons. cwt.
Jan. 1 to Mar. 31, 1882	1458 1,102,436	Jan. 1 to Mar. 31, 1882	1,538,950 0
Jan. 1 to Mar. 31, 1881	1334 1,028,082	Jan. 1 to Mar. 31, 1881	1,657,159 12
Increase—1882	124 74,404	Decrease—1882	71,259 4

EXPORTS.	
Railway-borne coal passing "in transitu" through district	Tons 81,360
Sea-borne coal exported to British Possessions, or to foreign ports, or to the coast	95,397
Ditto sent beyond limits by railway	19,325
Ditto by canal and inland navigation	1,748 117,488
Railway-borne coal exported to British Possessions, or to foreign ports, or the coast	31,368
Ditto, by canal and inland navigation	94 31,460
Sea-borne coal brought into port, & exported in same ships	1,934
Total quantity of coal conveyed beyond limits of coal duty district during March, 1882	232,159
Ditto, during March, 1881	215,420

Comparative Statement, 1881 and 1882.

Total distribution of coal from Jan. 1 to March 31, 1882	683,658
Total distribution of coal from Jan. 1 to March 31, 1881	684,985
Increase in the present year	23,642

General Statement, 1881 and 1882.

Increase in coals exported	23,642
Deduct increase in coals by sea	74,404
Less increase in coal by railway	71,259 = 8,481
Total decrease in trade within the coal district	20,497

WILLIAM MENELAUS.—By the death of Mr. William Menelaus, which took place at Tenby last week, the iron and steel industry of this country has lost one of its most active and energetic members, his name having been honourably identified with nearly all of the many improvements in the manufacture of iron and steel introduced in South Wales during the past quarter of a century. Mr. Menelaus had been connected with the Downla's Ironworks for 31 years, for 26 years of which he was general manager, which position he occupied at the time of his death. He was the founder of the South Wales Institute of Engineers, past-president and one of the earliest members of the Iron and Steel Institute; and was highly esteemed as a sound practical man throughout the country. One of his last public acts was the presentation to the Cardiff Free Library of a magnificent collection of pictures estimated to be worth 10,000l. He had been in failing health for some time and during the present week was seized with paralysis, which terminated fatally. He was in the 65th year of his age.

CHILIAN SILVER MINES.—THE AUTOGASTA DISTRICT.—The production of the mines of the Autogasta district has fallen off considerably during the last few years. There are indications of a slight improvement again, and as labour and means of transit from the mines to the coast cheapen, there is every prospect of more work being done. The mines are at a distance of about 120 miles north-east from Autogasta. There is a railway for about 70 miles, but the remaining distance is over a heavy sandy road without water. Freight on all goods from Autogasta to the Caracoles mines, including the railway freight, is \$2 per Spanish quintal; and from Caracoles to the port, \$1 per quintal. The output of the mines is brought down in the ore to Autogasta, to be worked up into bar silver either by amalgamation or by smelting in the two establishments, one on each principle. The total export of bar silver for the first six months of 1881 was \$764,850, and 4776 marks of silver was exported in other forms, value unknown. The total exports of silver were—357,322 marks, 302,526 marks, and 239,619 marks in 1878 and two following years. The above exports refer only to the production of the district of Autogasta. In the years 1878 and 1879 a portion of the production of silver from the Bolivian interior—mine of Huanchaca—passed through Autogasta. The war which broke out in 1879 interfered with the transit. In 1878, 170,154 marks of Huanchaca metal was exported through Autogasta; and in 1879, 17,830 marks. There is no authentic information as to the export of silver from Autogasta previously to 1878. The export of copper is in the form of silver-copper regulus, but there are no statistics as to the quantity exported. The only direct importations from abroad to Autogasta are coal and coke.

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* Being Notes on a Course of Lectures on Mining, delivered by Herr Berggrath Dr. VON TROSTEN, Director of the Royal Bergakademie, Clausthal, the Harz, Germany.



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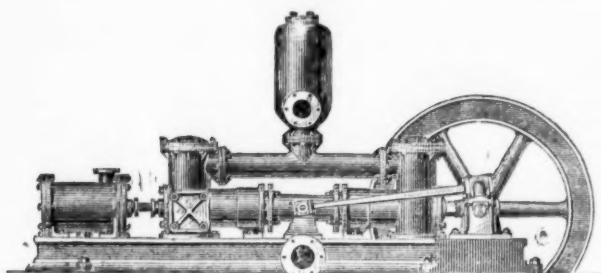
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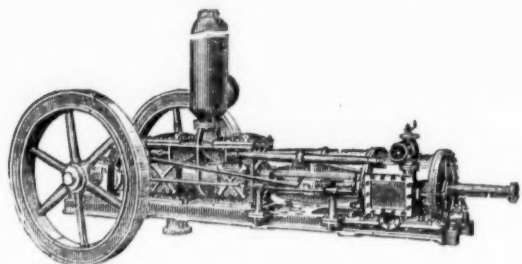


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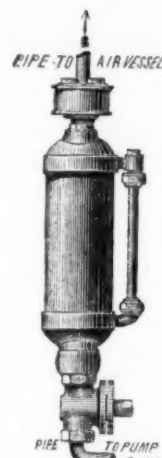
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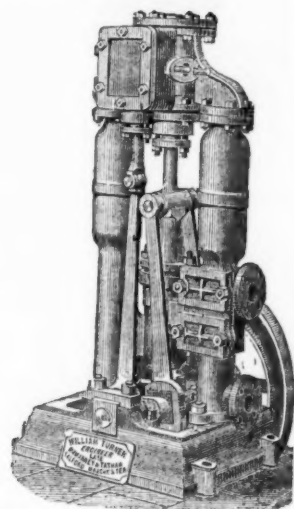
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FOREIGN MINING AND METALLURGY.

A decline, which had been fully anticipated, has occurred in household coal in Belgium. The extent of the decline is 10d. per ton. Industrial coal is generally reported to be firm in Belgium—in fact, the demand for this article appears to be better than it has been for some little time past. The market for coke has been a little less firm in the Charleroi Basin, where business has been done in ordinary unwashed descriptions at 13s. 8d. per ton; it is expected, however, that business in coke will soon regain a firm tone, as orders are arriving freely at the metallurgical establishments. In the Liège district washed coke has been sold at 16s. 10d. per ton, and unwashed coke at 18s. 2d. per ton. The question of the probable inefficiency of trucks in the autumn upon the Belgian State railways has been brought before the Belgian Chamber of Deputies, M. Houtart having made himself the organ of the apprehensions entertained by many industrials upon the subject. The Minister of Public Works made the satisfactory announcement that he proposed to solicit a vote of credit with a view of placing more trucks upon the line after Easter. The coal trade is not more active in Austria than in other countries. A denial is given to a statement which recently obtained currency that the consumption of Bohemian lignites has been considerably extended in Germany. In default of reliable statistics upon the subject, this negation is supported by the fact that a restriction is observable in the working of lignites in Bohemia.

The sale of coal is becoming more and more restricted at Paris, and prices appear to be gradually tending downwards. In the Nord also the coal trade is very quiet, and there is little immediate prospect of a return of activity. The collieries will profit from the accustomed slackening in mining from March to August, in order to develop preparatory works, complete fittings, &c. A new Russian Customs tariff for coal and iron will come into force in the middle of July. This measure, which will particularly affect Russian industry, has occasioned some agitation in Upper Silesia, from which district 750,000 tons of coal are annually forwarded to Russia. It is stated that the object of increasing the duties levied on coal passing the Russian frontier is to protect the colliery interests of Poland. The production of coal in Upper Silesia, it may be remarked, has been steadily increasing during the last seven years. In 1875 this production amounted to 16,504,931 tons. In 1879 it had grown to 17,819,806 tons, in 1880 to 20,033,038 tons, and in 1881 to 20,807,742 tons. Prices were slightly lower in 1881 than in 1880.

The tone of the Belgian iron trade has not sensibly varied during the past week; the markets remain undecided, most of the great Belgian establishments are working under favourable conditions, and are assured employment for some time to come, but little disposition is shown to conclude any contracts at present. Some industrials, less favourably circumstanced than others, are accepting the lower terms offered to them by purchasers. But this policy is happily exceptional. The price of iron continues officially fixed in Belgium at 5l. 12s. per ton, but in some cases 5l. 10s. has been accepted. An advance was anticipated in March in the rates current for bars on the Austrian markets, but as many purchasers have postponed giving out rather important orders, the upward movement in prices which has been noticed for some past has, if anything, experienced a slight check. The principal Austrian works engaged in the production of bars have still a good many orders to work out, but they would readily accept new orders, although they are not disposed to make any concessions of importance in regard to prices. When the spring has a little further advanced, the Austrian markets will no doubt acquire a more definite tone. There has been a good deal of activity in the demand for plates in Austria.

The state of the iron trade continues satisfactory in the Nord and the Haute-Marne (France). Orders still come to hand freely. Rains which have fallen have also enabled the works of the Haute-Marne to carry on their operations with energy. Coke made iron has made 8l. to 8l. 12s. in this district. Upon the Paris market the keen competition prevailing in the trade has occasioned a fall of 4s. per ton in merchants' iron; the margin between the rates current at the forges and those prevailing upon the Paris market is now much reduced. Plates have maintained a better tone than iron; ordinary plates have made 11l. 4s. per ton. Old rails are in much less favour, they are offered at 5l. per ton, but consumers show little eagerness to make purchases. In the Meurthe-et-Moselle, as well as

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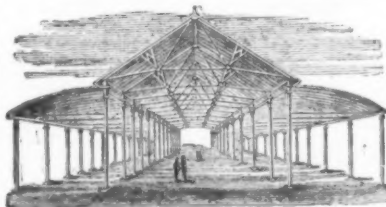
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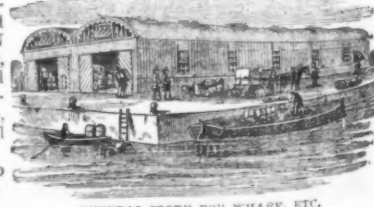
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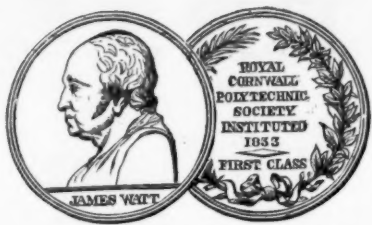
in the Luxemburg and in Lorraine, sales with delivery within a short period are in some measure suspended in consequence of available supplies having failed. White refining pig has made 2l. 17s. 6d. to 2l. 18s. 4d. per ton; white speckled pig 2l. 18s. 4d. to 2l. 19s. 2d. per

ton; grey speckled pig 2l. 19s. 2d. to 3l. per ton; and grey pig 3l. to 3l. 0s. 10d. per ton. The Lorraine Industrial Company has just commenced the construction of a second blast-furnace at Hussigny.

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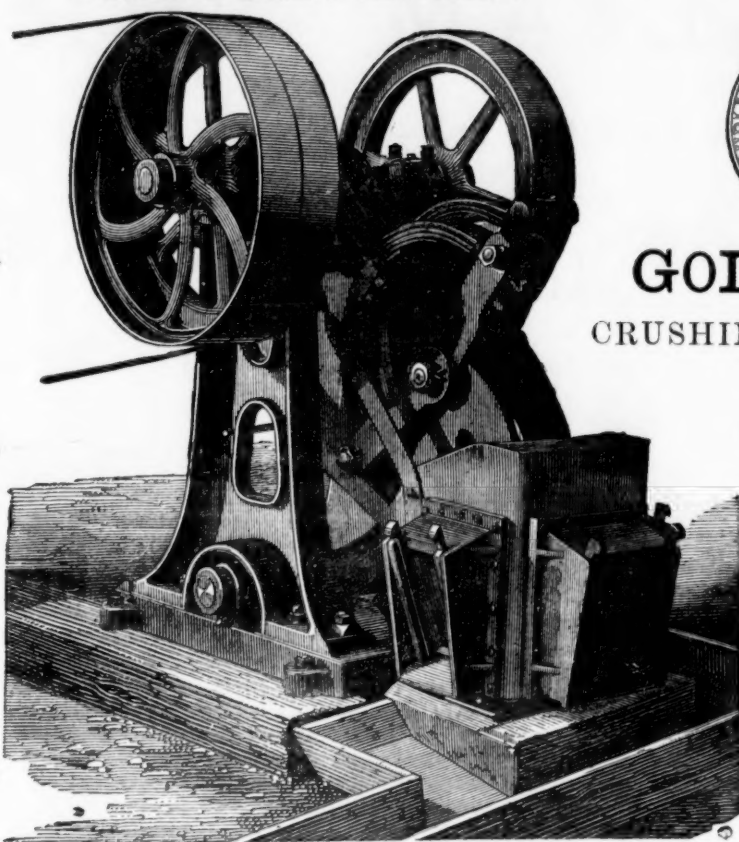
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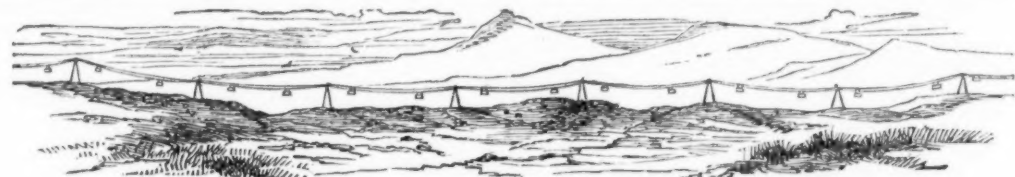
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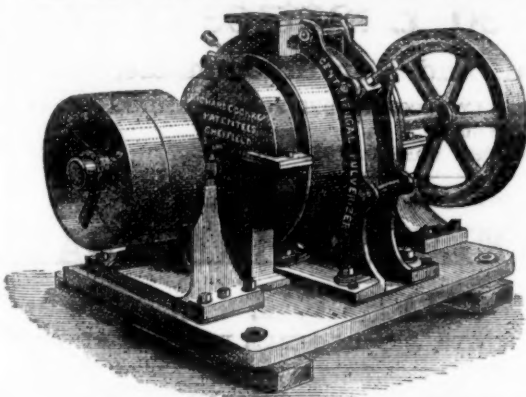
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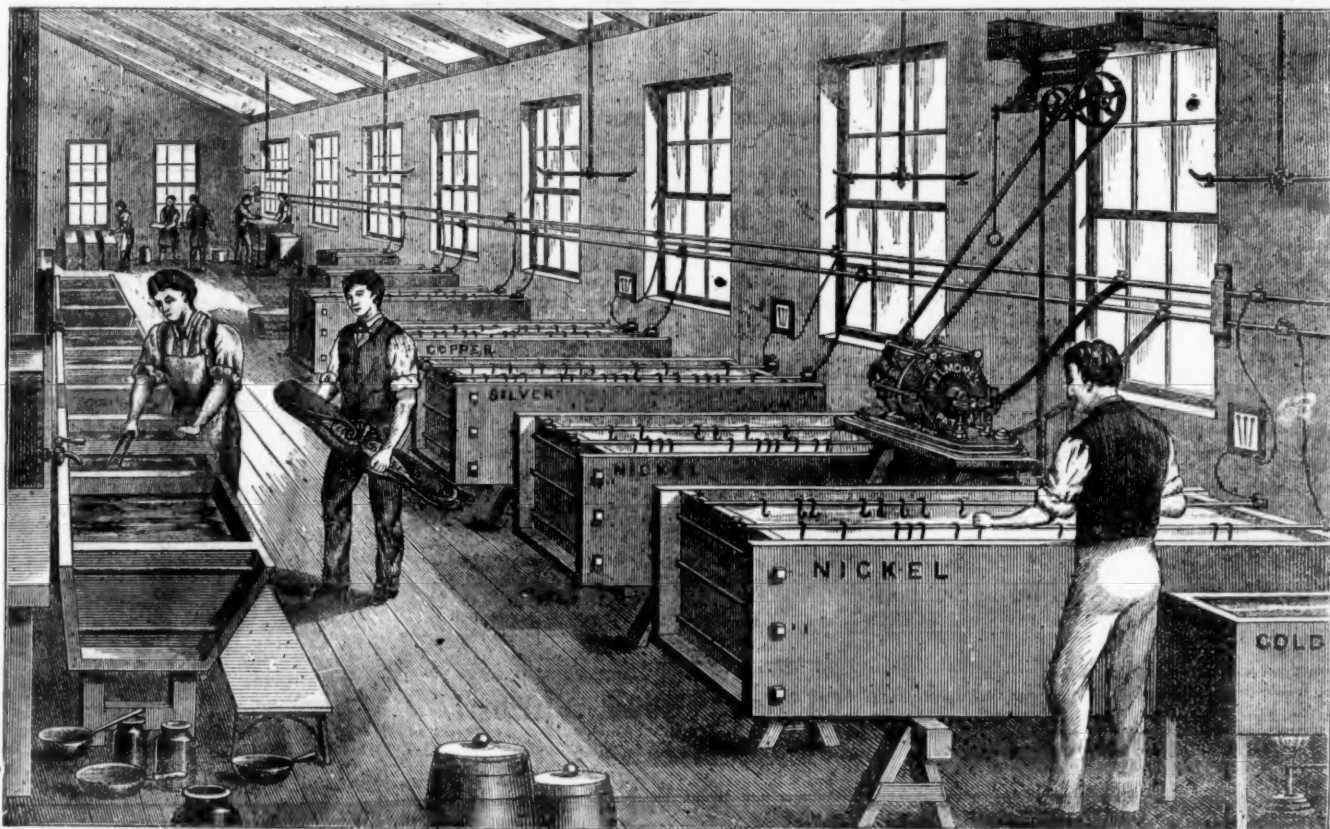
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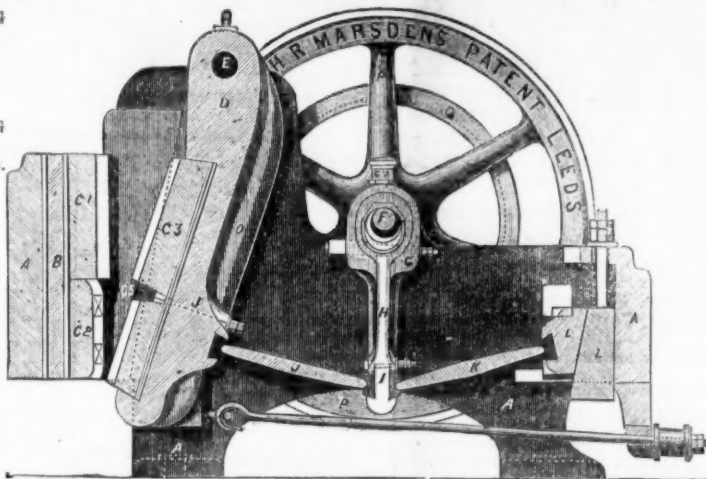
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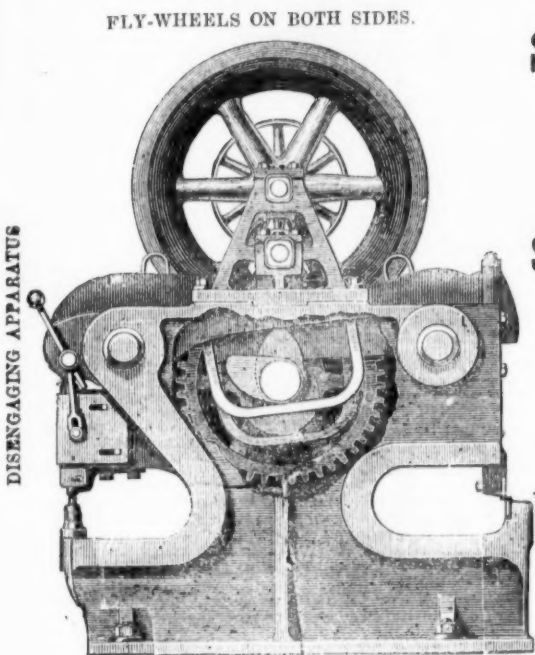
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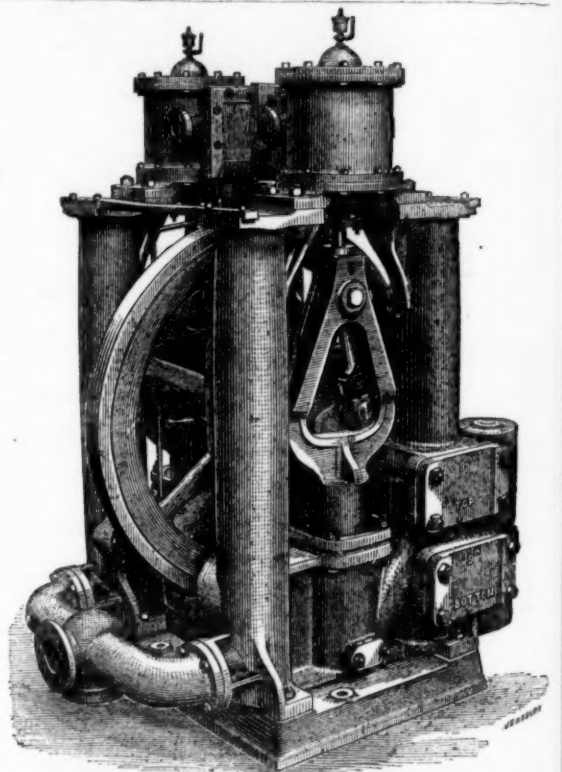
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